Chemical Engineering Science

List of Contents and Author Index Volume 51, 1996



CHEMICAL ENGINEERING SCIENCE

BOARD OF EDITORS FOR CHEMICAL ENGINEERING SCIENCE

- PROF. J. BRIDGWATER (CHAIRMAN) Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge CB2 3RA, U.K.
- PROF. A. T. Bell* Department of Chemical Engineering, University of California, Berkeley, CA 94720, U.S.A.
- PROF. R. A. BROWN* Department of Chemical Engineering, Massachusetts Institute of Technology, Room 66-342, Cambridge, MA 02139, U.S.A.
- PROF. J.-C. CHARPENTIER CNRS CPE Lyon, BP2077, F-69616 Villeurbanne Cedex, France
- PROF. DR.-ING. E. D. GILLES Institut für Systemdynamik und Regelungstechnik, Universität Stuttgart, D-70174 Stuttgart 80, Germany
- DR L. GLADDEN Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge CB2 3RA, U.K.
- PROF. M. KWAUK Institute of Chemical Metallurgy, Beijing, China
- PROF. E. N. LIGHTFOOT (BOOK REVIEW EDITOR) Department of Chemical Engineering, University of Wisconsin, 1415 Johnson Drive, Madison, WI 53706, U.S.A.
- DR R. A. MASHELKAR Council of Scientific & Industrial Research, Anusandhan Bhavan, Rafi Marg, New Delhi 110001,
- PROF. D. M. RUTHVEN* Chemical Engineering Department, University of Maine, Orono, ME 04469-5737, U.S.A.
- PROF. W. P. M. VAN SWAAIJ Department of Chemical Engineering, Twente University of Technology, PO Box 217, 7500 AE Enschede, The Netherlands
- PROF. J. VILLADSEN Instituttet for Bioteknologi, Danmarks Tekniske Hojskole, Bygning 223, 2800 Lyngby, Denmark *See Notes for Contributors.

Production Editor (Elsevier Science Ltd): Sara Brunton. Tel.: (+1865) 843466. Fax: (+1865) 843969.

Publishing and Advertising Offices

Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. Tel.: (+1865) 843000, Fax: (+1865) 843010, e-mail address: chemistry.production@elsevier.co.uk

Frequency: Published semi-monthly

Subscription Information

Annual Institutional Subscription Rates 1997: Europe, The CIS and Japan 4789.00 Dutch Guilders. All other countries US\$2956.00. Dutch Guilder prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice. Any enquiry relating to subscriptions should be sent to:

The Americas: Elsevier Science Customer Support Department, P.O. Box 945, New York, NY 10010, U.S.A. [Tel.: (+1) 212-633-3730/1-888 4ES-INFO. Fax: (+1) 212-633-3680. E-mail: usinfo-f@elsevier.com].

Japan: Elsevier Science Customer Support Department, 9-15 Higashi-Azabu 1-chome, Minato-ku, Tokyo 106, Japan [Tel.: (+3) 5561-5033. Fax: (+3) 5561-5047. E-mail: kyf04035@niftyserve.or.jp].

Asia Pacific (excluding Japan): Elsevier Science (Singapore) Pte Ltd, No. 1 Temasek Avenue, 17-01 Millenia Tower, Singapore 039192. [Tel.: (+65) 434-3727. Fax: (+65) 337-2230. E-mail: asiainfo@elsevier.com.sg].

Rest of the World: Elsevier Science Customer Service Department, P.O. Box 211, 1001 AE Amsterdam, The Netherlands. [Tel.: (+31) 20-485-3757. Fax: (+31) 20-485-3432. E-mail: nlinfo-f@elsevier.nl].

ContentsDirect: ContentsDirect delivers the table of contents of this journal, by e-mail, approximately two to four weeks prior to the publication of each issue. To subscribe to this free service, please complete and return the form at the back of this issue to your nearest Elsevier Science office, or send an e-mail message to d.jones@elsevier.co.uk.

Back Issues: Back issues of all previously published volumes are available direct from Elsevier Science Offices (Oxford and New York). Complete volumes and single issues can be purchased for 1990-1995. Earlier issues are available in high quality photo-duplicated copies as complete volumes only. Back volumes on microfilm are available from UMI, 300 North Zeeb Road, Ann Arbor, MI 48106, U.S.A.

© 1996 Elsevier Science Ltd

PERIODICALS POSTAGE PAID AT NEWARK, NEW JERSEY AND ADDITIONAL ENTRY POINTS. Chemical Engineering Science (ISSN 0009-2509) is published semi-monthly, two issues per month January to December in one volume, by Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. The annual subscription in the U.S.A. is \$2956.00. Chemical Engineering Science is distributed by Mercury Airfreight International Ltd, 10 Camptown Road, Irvington, NJ 07111-1105. POSTMASTER: Please send address corrections to Chemical Engineering Science, c/o Elsevier Science Regional Sales Office, Customer Support Department, 655 Avenue of the Americas, New York, NY 10010, U.S.A. [Tel.: (+1) 212-633-3730/1-888 4ES-INFO. Fax: (+1) 212-633-3680. E-mail: usinfo-f@elsevier.com].

LIST OF CONTENTS

Number 1

Article Number 48. Heat transfer to walls of a ng fluidized-bed furnace ansfer to freely-moving drops studies of acid-inactivation of α-amylase from
studies of acid-inactivation of a-amylase from
llus oryzae
ence of two gas slugs rising in a vertical column of
mal multiplicity in catalytic surface reactions with the dependent parameters—case of polyatomic
dynamic behavior of continuous solution rization reactors—IX. Effects of inhibition
e of the Karhunen-Loève decomposition for the ng of distributed parameter systems
e particle simulation of bubble and slug formation wo-dimensional gas-fluidised bed: a hard-sphere ch
on rate of celestite and calcite
tion of a model for the prediction of phase ria from general molecular parameters I: -liquid equilibria and enthalpy at low pressures
tion of a model for the prediction of phase ria from general molecular parameters II: binary liquid equilibria at low pressures
r Communications
ace of the system geometry on the sedimentation veness of lamella settlers
utation of reaction rates for catalytic reactions inhomogeneous surfaces with multicomponent corption
brium data and thermodynamic modelling of exane gas hydrates
Review
near Oscillations. By A. H. Nayfeh and D. T. Mook

Number 2

167 Review Article Number 49. Effects of temperature and pressure on gas-solid fluidization

List of Contents

•	•	or contents
A. S. T. Chiang	207	An analytical solution to equilibrium PSA cycles
J. Lee and S. J. Parulekar	217	Periodic operation of continuous recombinant cultures improves antibiotic selection
K. E. Morud and B. H. Hjertager	233	LDA measurements and CFD modelling of gas-liquid flow in a stirred vessel
S. Appleby and A. Wilson	251	Permeability and suction in setting cement
V. Bourdin, L. M. Sun, Ph. Grenier and F. Meunier	269	Analysis of the temperature frequency response for diffusion in crystals and biporous pellets
A. K. Hipp and W. H. Ray	281	A dynamic model for condensation polymerization in tubular reactors
S. Charton, V. Blet and J. P. Corriou	295	A simplified model for real gas expansion between two reservoirs connected by a thin tube
H. Muhr, R. David, J. Villermaux and P. H. Jezequel	309	Crystallization and precipitation engineering—VI. Solving population balance in the case of the precipitation of silver bromide crystals with high primary nucleation rates by using the first order upwind differentiation
F. I. C. C. Pais and A. A. T. G. Portugal	321	Shorter Communication Steady-state behaviour of isothermal two-phase continuous stirred tank reactors for extreme solids concentrations
E. N. Lightfoot	325	Book Reviews Membrane Separations Technology: Principles and Applications, edited by R. D. Noble and S. A. Stern
M. J. Betenbaugh	326	Baculovirus Expression Systems and Biopesticides, edited by Michael L. Shuler, H. Alan Wood, Robert R. Granados and Daniel A. Hammer
		Number 3
C. Oost and U. Hoffmann	329	The synthesis of tertiary amyl methyl ether (TAME): microkinetics of the reactions
N. Funamizu and T. Takakuwa	341	A minimal potential energy model for predicting stratifi- cation pattern in binary and ternary solid-liquid fluidized beds
A. Soldati and P. Andreussi	353	The influence of coalescence on droplet transfer in vertical annular flow
J. Xu and R. Agrawal	365	Membrane separation process analysis and design strategies based on thermodynamic efficiency of permeation
T. Basak, K. K. Rao and A. Bejan	387	A model for heat transfer in a honey bee swarm
S. Subramanian and V. Balakotaiah	401	Classification of steady-state and dynamic behavior of distributed reactor models
B. King and D. D. Do	423	Measurement of multicomponent adsorption kinetics of gases in activated carbon by a batch adsorber FT-IR technique
G. W. Roberts and H. H. Lamb	441	The effect of reversibility on the selectivity of parallel reactions in a porous catalyst

A. K. M. S. Rahman and S. Palanki	449	On-line optimization of batch processes with nonlinear manipulated input
A. Mehra	461	Gas absorption in reactive slurries: particle dissolution near gas-liquid interface
D. M. Leppinen, M. Renksizbulut and R. J. Haywood	479	The effects of surfactants on droplet behaviour at intermediate Reynolds numbers—I. The numerical model and steady-state results
D. M. Leppinen, M. Renksizbulut and R. J. Haywood	491	The effects of surfactants on droplet behaviour at intermediate Reynolds numbers—II. Transient deformation and evaporation
E. N. Lightfoot	503	Book Review Membrane Handbook. Edited by W. S. Winston Ho and Kamelesh K. Sirkar
		Number 4
V. G. Papadakis, M. N. Fardis and C. G. Vayenas	505	Physicochemical processes and mathematical modeling of concrete chlorination
Xu Zhusheng, Zhang Tao, Zang Lianfa, Wang Tao, Wu Jinrong, Chen Laiyuan and Lin Liwu	515	Role of steam on the reaction performance of methane oxidative coupling over basic catalysts
J. Lee and W. F. Ramirez	521	On-line optimal control of induced foreign protein production by recombinant bacteria in fed-batch reactors
M. Sheintuch and R. M. Dessau	535	Observations, modeling and optimization of yield, selec- tivity and activity during dehydrogenation of isobutane and propane in a Pd membrane reactor
J. Li, Z. Tekie, T. I. Mizan, B. I. Morsi, E. E. Maier and C. P. P. Singh	549	Gas-liquid mass transfer in a slurry reactor operating under olefinic polymerization process conditions
I. Devotta and R. A. Mashelkar	561	Competitive diffusion-adsorption of polymers of differing chain lengths on solid surfaces
M. S. Kulkarni and M. P. Duduković	571	A robust algorithm for fixed-bed reactors with steep moving temperature and reaction fronts
S. Kiil, S. K. Bhatia and K. Dam-Johansen	587	Modelling of catalytic oxidation of NH ₃ and reduction of NO on limestone during sulphur capture
M. N. Bogere	603	A rigorous description of gas-solid fluidized beds
J. Khinast, G. F. Krammer, Ch. Brunner and G. Staudinger	623	Decomposition of limestone: the influence of CO ₂ and particle size on the reaction rate
Yu. A. Buyevich	635	Particle distribution in suspension shear flow
T. Zhang and R. Datta	649	Ethers from ethanol—5. Equilibria and kinetics of the coupled reaction network of liquid-phase 3-methyl-3-ethoxy-pentane synthesis
H. T. Bi and J. R. Grace	663	Shorter Communications Radial pressure differences and their fluctuations in dense fluidized beds
Jinghai Li, Guihua Qian and Lixiong Wen	667	Gas-solid fluidization: a typical dissipative structure

List of Contents

Number 5

		Number 3
I. V. Melikhov, V. M. Podkopov, B. A. Ilyin and E. D. Kozlovskaya	671	Periodical crystallization variability
M. Chocrón, M. C. Raffo Calderón, N. Amadeo and M. Laborde	683	Effect of intraparticle diffusion on catalyst decay
Chengfa Jiang	689	Thermodynamics of aqueous phosphoric acid solution at 25°C
Y. Taitel and L. Witte	695	The role of surface tension in microgravity slug flow
C. C. Simms, B. K. Arumugam and P. C. Wankat	701	Modified displacement chromatography cycles for gas systems
M. Foka, J. Chaouki, C. Guy and D. Klvana	713	Gas phase hydrodynamics of a gas-solid turbulent fluidized bed reactor
T. Nosoko, P. N. Yoshimura, T. Nagata and K. Oyakawa	725	Characteristics of two-dimensional waves on a falling liquid film
D. J. Lamberto, F. J. Muzzio, P. D. Swanson and A. L. Tonkovich	733	Using time-dependent RPM to enhance mixing in stirred vessels
N. Greenberg, B. Tartakovsky, G. Yirme, S. Ulitzur and M. Sheintuch	743	Observations and modeling of growth of immobilized microcolonies of luminous E. coli
Y. Zhong, V. M. Godfrey, P. K. Lim and P. A. Brown	757	Biphasic synthesis of phenylacetic and phenylenediacetic acids by interfacial carbonylation of benzyl chloride and dichloro-p-xylene
Y. Samyudia, P. L. Lee, I. T. Cameron and M. Green	769	Control strategies for a supercritical fluid extraction process
A. L. Y. Tonkovich, J. L. Zilka, D. M. Jimenez, G. L. Roberts and J. L. Cox	789	Experimental investigations of inorganic membrane reactors: a distributed feed approach for partial oxidation reactions
D. S. Grzegorczyk and G. Carta	807	Adsorption of amino acids on porous polymeric adsorbents—I. Equilibrium
D. S. Grzegorczyk and G. Carta	819	Adsorption of amino acids on porous polymeric adsorbents—II. Intraparticle mass transfer
Ho-Shing Wu	827	Shorter Communications Mathematical modeling for liquid-liquid phase-transfer catalysis
S. Kumar	831	On phase inversion characteristics of stirred dispersions
J. C. Gottifredi and E. E. Gonzo	835	An approximate expression for predicting concentration and temperature profiles inside a catalyst pellet
M. C. M. Cockrem	839	Book Review Crystallization Technology Handbook. Edited by A. Mersmann
		Number 6

Shou Xu, Yi-Wei Wang, F. D. Otto and A. E. Mather 841 Kinetics of the reaction of carbon dioxide with 2-amino-2methyl-1-propanol solutions

M. K. Neylon and P. E. Savage	851	Analysis of non-isothermal heterogeneous autocatalytic reactions
M. Shishido and M. Toda	859	Simulation of oxygen concentration profile in calcium alginate gel beads entrapping microbes during biological phenol degradation
P. A. Langston, U. Tüzün and D. M. Heyes	873	Distinct element simulation of interstitial air effects in axially symmetric granular flows in hoppers
J. Procházka and A. Heyberger	893	Correlation of ternary liquid-liquid equilibria in system isobutyl acetate-acetic acid-water
B. Bojkov and R. Luus	905	Optimal control of nonlinear systems with unspecified final times
J. S. Vrentas and C. M. Vrentas	921	Axial moment analyses of convective heat and mass transfer processes
M. Pottmann, M. A. Henson, B. A. Ogunnaike and J. S. Schwaber	931	A parallel control strategy abstracted from the baroreceptor reflex
S. Reddy, L. R. Moore, Liping Sun, M. Zborowski and J. J. Chalmers	947	Determination of the magnetic susceptibility of labeled particles by video imaging
D. Bai, E. Shibuya, Y. Masuda, N. Nakagawa and K. Kato	957	Flow structure in a fast fluidized bed
P. B. Sørensen, P. Moldrup and J. AA. Hansen	967	Filtration and expression of compressible cakes
J. I. Ramos	981	Inviscid, slender, annular liquid jets
L. A. M. van der Wielen, M. H. H. van Dam and K. Ch. A. M. Luyben	995	On the relative motion of a particle in a swarm of different particles

Number 7

M. C. Jones, R. D. Nassimbene and J. D. Wolfe	1009	Mixing and dispersion measurements on packed bed flows using a fiberoptic probe array
A. Converti, M. Casagrande, M. De Giovanni, M. Rovatti and M. Del Borghi	1023	Evaluation of glucose diffusion coefficient through cell layers for the kinetic study of an immobilized cell bioreactor
Yu Chen and Thiam-Chye Tan	1027	Modelling and experimental study of the transient behaviour of plant tissue sensors in sensing dopamine
G. M. Martinez and D. Basmadjian	1043	Towards a general gas adsorption isotherm
J. Lang	1055	High-resolution self-adaptive computations on chemical reaction-diffusion problems with internal boundaries
V. Hanagandi, H. Ploehn and M. Nikolaou	1071	Solution of the self-consistent field model for polymer adsorption by genetic algorithms
C. S. Chern and Y. N. Kuo	1079	Shear-induced coagulation kinetics of semibatch seeded emulsion polymerization
M. H. Wilcoxson and V. I. Manousiouthakis	1089	Simulation of a three-moment fluid model of a two- dimensional radio frequency discharge

List of Contents

L. Boshoff-Mostert and H. J. Viljoen	1107	Analysis of homogeneous combustion in monolithic structures
 J. R. González-Velasco, J. A. González-Marcos, J. A. Delgado, C. González-Ortiz de Elguea and J. I. Gutiérrez-Ortiz 	1113	Prediction of lifetime of poly(2-hexyne) films through the kinetics of thermooxidative degradation from thermogravimetric and molecular weight data
C. Di Blasi	1121	Heat, momentum and mass transport through a shrinking biomass particle exposed to thermal radiation
S. U. Sane, H. W. Haynes, Jr and P. K. Agarwal	1133	An experimental and modelling investigation of gas mixing in bubbling fluidized beds
G. P. Rangaiah and P. R. Krishnaswamy	1149	Estimating second-order dead time parameters from underdamped process transients
A. T. Conlisk	1157	Analytical solutions for falling film absorption of ternary mixtures, part 1: theory
M. Favelukis and R. Semiat	1169	Shorter Communications Mass transfer between a slender bubble and a viscous liquid in axisymmetric extensional flow
D. G. Karamanev, C. Chavarie and R. Samson	1173	Hydrodynamics and mass transfer in an airlift reactor with a semipermeable draft tube
R. P. Zou and A. B. Yu	1177	Wall effect on the packing of cylindrical particles
		Number 8
I. A. Natalukha	1181	Unstable regimes of continuous crystallization in a cascade of well-mixed vessels
Shih-Haur Shen, Hong-Den Yu and Cheng-Ching Yu	1187	Use of saturation-relay feedback for autotune identification
T. Lücke and H. Fissan	1199	The prediction of filtration performance of high efficiency gas filter elements
H. A. Nasr-El-Din, R. S. Mac Taggart and J. H. Masliyah	1209	Local solids concentration measurement in a slurry mixing tank
J. P. Lederhos, J. P. Long, A. Sum, R. L. Christiansen and E. D. Sloan, Jr	1221	Effective kinetic inhibitors for natural gas hydrates
P. N. Yoshimura, T. Nosoko and T. Nagata	1231	Enhancement of mass transfer into a falling laminar liquid film by two-dimensional surface waves—some experimental observations and modeling
F. A. Hessari and S. K. Bhatia	1241	Reaction rate hysteresis in a single partially internally wetted catalyst pellet: experiment and modelling
F. A. Banat and J. Simandl	1257	Removal of benzene traces from contaminated water by vacuum membrane distillation
A. Löwe	1267	A note on concentration control in gradientless recycle reactors
A. T. Conlisk and J. Mao	1275	Nonisothermal absorption on a horizontal cylindrical tube—1. The film flow

G. Desmet, H. Verelst 1287 Local and global dispersion effects in Couette-Taylor and G. V. Baron flow-I. Description and modeling of the dispersion effects G. Desmet, H. Verelst Local and global dispersion effects in Couette-Taylor and G. V. Baron flow-II. Quantitative measurements and discussion of the reactor performance S. Kumar and D. Ramkrishna 1311 On the solution of population balance equations by discretization-I. A fixed pivot technique S. Kumar and D. Ramkrishna 1333 On the solution of population balance equations by discretization-II. A moving pivot technique Shorter Communications H. Nakamura, S. Asai 1343 Protection of the amino group of DL-serine with carboand M. Yamada benzoxy chloride via inverse-phase transfer catalysis J. R. Burns and C. Ramshaw 1347 Process intensification: visual study of liquid maldistribution in rotating packed beds Letters to the Editors 1353 Some comments on "Filterability measured by the D. J. Lee and W. W. Lin capillary suction time method" 1355 Authors' reply to the comments of D. J. Lee and G. H. Meeten and J. B. A. F. Smeulders W. W. Lin

Number 9

SPECIAL ISSUE FESTSCHRIFT FOR PROFESSOR R. BYRON BIRD

A. G. Fredrickson, S. Kim, J. C. Slattery and M. C. Williams	v	Editorial
J. C. Slattery and R. L. Robinson	1357	Effects of induced convection upon the rate of crystallization
R. L. Jones, L. Kane and R. J. Spontak	1365	Morphological characteristics of lamellar ABA triblock copolymers: a self-consistent field treatment
A. N. Sathyagal, D. Ramkrishna and G. Narsimhan	1377	Droplet breakage in stirred dispersions. Breakage functions from experimental drop-size distributions
K. Podual, R. Kumar and K. S. Gandhi	1393	A new model for drainage of static foams
J. Howell, R. Field and Dengxi Wu	1405	Ultrafiltration of high-viscosity solutions: theoretical developments and experimental findings
V. R. Iyengar and A. Co	1417	Film casting of a modified Giesekus fluid: stability analysis
H. K. Rasmussen and O. Hassager	1431	On the sedimentation velocity of spheres in a polymeric liquid
J. M. Wiest	1441	Nonequilibrium energetic effects in the inception of shear flow of dilute polymer solutions

List of Contents

A. N. Beris and R. Sureshkumar 1451 Simulation of time-dependent viscoelastic channel Poiseuille flow at high Reynolds numbers C. C. Hua and J. D. Schieber 1473 Application of kinetic theory models in spatiotemporal flows for polymer solutions, liquid crystals and polymer melts using the CONNFFESSIT approach E. Eteshola, M. Gottlieb 1487 Dilute solution viscosity of red microalga exopolyand S. Arad saccharide M. L. Mavrovouniotis 1495 Duality theory for thermodynamic bottlenecks in bioreaction pathways J. D. Chung and G. Stephanopoulos 1509 On physiological multiplicity and population heterogeneity of biological systems L. E. Aloi and R. S. Cherry 1523 Cellular response to agitation characterized by energy dissipation at the impeller tip Number 10 SPECIAL ISSUE **ISCRE 14** CHEMICAL REACTION ENGINEERING: FROM FUNDAMENTALS TO COMMERCIAL PLANTS AND PRODUCTS PART A ix Preface Plenaries K. C. Waugh 1533 Kinetic modelling of industrial catalytic processes based upon fundamental elementary kinetics under ultra high vacuum F. J. Keil 1543 Modelling of phenomena within catalyst particles C. K. Harris, D. Roekaerts, 1569 Computational fluid dynamics for chemical reactor F. J. J. Rosendal, engineering F. G. J. Buitendijk, Ph. Daskopoulos, A. J. N. Vreenegoor and H. Wang J. J. Lerou and K. M. Ng 1595 Chemical reaction engineering: a multiscale approach to a multiobjective task R. J. Quann and S. B. Jaffe 1615 Building useful models of complex reaction systems in petroleum refining C. Kiparissides 1637 Polymerization reactor modeling: a review of recent developments and future directions

Kinetics of Heterogeneous Catalytic Reactions

M. V. Rajashekharam 1663 Kinetics of hydrogenation of p-isobutyl acetophenone and R. V. Chaudhari using a supported Ni catalyst in a slurry reactor

	L	ast of Contents
C. T. Williams, A. A. Tolia, M. J. Weaver and C. G. Takoudis	1673	Surface-enhanced Raman spectroscopy as an <i>in-situ</i> real-time probe of NO reduction over rhodium at high gas pressures
O. Hinrichsen, F. Rosowski, M. Muhler and G. Ertl	1683	The microkinetics of ammonia synthesis catalyzed by cesium-promoted supported ruthenium
M. Neurock, W. D. Provine, D. A. Dixon, G. W. Coulston, J. J. Lerou and R. A. van Santen	1691	First principle analysis of the catalytic reaction pathways in the synthesis of vinyl acetate
Applicati	ions of (Computational Fluid Dynamics
S. Grevskott, B. H. Sannæs, M. P. Duduković, K. W. Hjarbo and H. F. Svendsen	1703	Liquid circulation, bubble size distributions, and solids movement in two- and three-phase bubble columns
C. Fleischer, S. Becker and G. Eigenberger	1715	Detailed modeling of the chemisorption of CO ₂ into NaOH in a bubble column
C. Xuereb and J. Bertrand	1725	3-D hydrodynamics in a tank stirred by a double-propeller system and filled with a liquid having evolving rheological properties
P. Zehner and R. Benfer	1735	Modelling fluid dynamics in multiphase reactors
Bifurcations and	Spatio-T	emporal Patterns in Chemical Reactors
R. D. Otterstedt, P. J. Plath, N. I. Jaeger, J. C. Sayer and J. L. Hudson	-	Accelerating fronts during the electrodissolution of cobalt
A. K. Bangia, M. Bär, I. G. Kevrekidis, M. D. Graham, HH. Rotermund and G. Ertl	1757	Catalysis on microcomposite surfaces
L. Jelemensky, B. F. M. Kuster and G. B. Marin	1767	Kinetic modelling of multiple steady-states for the oxidation of aqueous ethanol with oxygen on a carbon supported platinum catalyst
M. P. Harold, J. J. Ostermaier, D. W. Drew, J. J. Lerou and D. Luss	1777	The continuously-stirred decanting reactor: steady state and dynamic features
	1	Novel Reactors
K. Takács, H. P. Calis,A. W. Gerritsenand C. M. Van Den Bleek	1789	The selective catalytic reduction of nitric oxide in the bead string reactor
J. Pruski, A. Pekediz and H. de Lasa	1799	Catalytic cracking of hydrocarbons in a novel riser simulator: lump adsorption parameters under reaction conditions
R. Maciel Filho, L. M. F. Lona Batista and M. Fusco	1807	A fast fluidized bed reactor for industrial FCC regenerator
G. Capannelli, E. Carosini, F. Cavani, O. Monticelli and F. Trifiro	1817	Comparison of the catalytic performance of V_2O_5/γ -Al ₂ O ₃ in the oxidehydrogenation of propane to propylene in different reactor configurations: i) packed-bed reactor, ii) monolith-like reactor and iii) catalytic membrane reactor

membrane reactor

List of Contents

M. Mazzotti, A. Kruglov, B. Neri, D. Gelosa and M. Morbidelli	1827	A continuous chromatographic reactor: SMBR
C. Horst, YS. Chen, U. Kunz and U. Hoffmann	1837	Design, modeling and performance of a novel sono- chemical reactor for heterogeneous reactions
P. Roquero, A. Ghanem-Lakhal, P. Cognet, G. Lacoste, J. Berlan, PL. Fabre and P. Duverneuil	1847	A new reactor for industrial organic electrosynthesis
F. Trabelsi, H. Aït-Lyazidi, B. Ratsimba, A. M. Wilhelm, H. Delmas, P-L. Fabre and J. Berlan	1857	Oxidation of phenol in wastewater by sonoelectro- chemistry
Trans	port and	Reaction in Porous Media
R. Claessens and G. V. Baron	1869	
T. Masuda, K. Fukada, Y. Fujikata, H. Ikeda and K. Hashimoto	1879	Measurement and prediction of the diffusivity of Y-type zeolite
R. Scharfenberg, K. Meyerhoff and D. Hesse	1889	Problems in the determination of pore connectivity by digital image processing
	Control	of Chemical Reactors
J. Fotopoulos, C. Georgakis and H. G. Stenger, Jr	1899	
Y. S. Cheng, T. Mongkhonsi and L. S. Kershenbaum	1909	Nonlinear dynamic estimation for a fixed-bed reactor with decaying catalysts
P. Appelhaus and S. Engell	1919	Design and implementation of an extended observer for the polymerization of polyethylenterephthalate
Kuochen Tsai and R. O. Fox	1929	- and Macromixing Modeling the scalar dissipation rate for a turbulent series-parallel reaction
J. Villermaux	1939	Trajectory length distribution (TLD), a novel concept to characterize mixing in flow systems
H. Z. Li, Ch. Fasol and L. Choplin	1947	Hydrodynamics and heat transfer of rheologically complex fluids in a Sulzer SMX static mixer
Jianfeng Chen, Chong Zheng and Gantang Chen	1957	Interaction of macro- and micromixing on particle size distribution in reactive precipitation
S. Degaleesan, S. Roy, S. B. Kumar and M. P. Duduković	1967	Liquid mixing based on convection and turbulent dispersion in bubble columns
	Fluid	lized Bed Reactors
A. Kantzas and N. Kalogerakis	1979	Monitoring the fluidization characteristics of polyolefin resins using X-ray computer assisted tomography scanning
J. C. Schouten, M. L. M. Vander Stappen and C. M. Van Den Bleek	1991	Scale-up of chaotic fluidized bed hydrodynamics

WG. Liang, JX. Zhu, Y. Jin, ZQ. Yu, ZW. Wang and J. Zhou	2001	Radial nonuniformity of flow structure in a liquid-solid circulating fluidized bed
M. Cassanello, F. Larachi, C. Guy and J. Chaouki	2011	Solids mixing in gas-liquid-solid fluidized beds: experiments and modelling
O. C. Snip, M. Woods, R. Korbee, J. C. Schouten and C. M. Van Den Bleek	2021	Regenerative removal of SO ₂ and NO _x for a 150 MWe power plant in an interconnected fluidized bed facility
M. Mortensen, R. G. Minet, T. T. Tsotsis and S. Benson	2037	A two-stage cyclic fluidized bed process for converting hydrogen chloride to chlorine
R. Krishna, J. Ellenberger and S. T. Sie	2041	Reactor development for conversion of natural gas to liquid fuels: a scale-up strategy relying on hydrodynamic analogies

Kinetics of Complex Reactions

	Ainetics	of Complex Reactions
K. P. de Jong, C. M. A. M. Mesters, D. G. R. Peferoen, P. T. M. van Brugge and C. de Groot	2053	Paraffin alkylation using zeolite catalysts in a slurry reactor: chemical engineering principles to extend catalyst lifetime
R. R. Sadhankar and D. T. Lynch	2061	Slow convergence to cycle-invariance during forced oscillations of the NO + CO reaction over a Pt catalyst
S. P. Gupte, V. P. Krishnamurthy and R. V. Chaudhari	2069	Kinetics and mechanism of Carbonylation of allyl chloride using a Pd catalyst: a case of gas-liquid-liquid-solid catalytic reaction
S. J. Parulekar and N. A. S. Amin	2079	Complex gas-liquid reactions: feedback from bulk liquid to liquid-side film

Reactor Modelling and Simulation

•		Touching and Shilliation
J. N. Papageorgiou and G. F. Froment	2091	Phthalic anhydride synthesis. Reactor optimization aspects
A. H. Benneker, A. E. Kronberg, J. W. Post, A. G. J. Van Der Ham and K. R. Westerterp	2099	Axial dispersion in gases flowing through a packed bed at elevated pressures
W. L. M. Weerts, M. H. J. M. de Croon and G. B. Marin	2109	Low pressure chemical vapour deposition of poly- crystalline silicon: validation and assessment of reactor models
C. R. Kleijn, K. J. Kuijlaars and H. E. A. Van Den Akker	2119	Design and scale-up of chemical vapour deposition reactors for semiconductor processing

	Thre	ee-Phase Reactors
N. Reinecke and D. Mewes	2131	Tomographic imaging of trickle-bed reactors
M. R. Khadilkar, Y. X. Wu, M. H. Al-Dahhan, M. P. Duduković and M. Colakyan	2139	Comparison of trickle-bed and upflow reactor performance at high pressure: model predictions and experimental observations
C. Joly-Vuillemin, C. de Bellefon and H. Delmas	2149	Solid effects on gas-liquid mass transfer in three-phase slurry. Catalytic hydrogenation of adiponitrile over Raney nickel

Applications of Neural Networks

- F. Stüber, A. M. Wilhelm 2161 Modelling of and H. Delmas significant che
 - 2161 Modelling of three phase catalytic upflow reactor: a significant chemical determination of liquid-solid and gas-liquid mass transfer coefficients
- X. Z. Wang, B. H. Chen, S. H. Yang and C. McGreavy
- 2169 Neural nets, fuzzy sets and digraphs in safety and operability studies of refinery reaction processes
- Xing-Gui Zhou, Liang-Hong Liu, Yin-Chun Dai, Wei-Kang Yuan and J. L. Hudson
- 2179 Modeling of a fixed-bed reactor using the K-L expansion and neural networks
- T. M. Leib, P. L. Mills and J. J. Lerou
- 2189 Fast response distributed parameter fluidized bed reactor model for propylene partial oxidation using feed-forward neural network methods

Gas-Solid Reactions

- T. Kopaç, G. Doğu and T. Doğu
- 2201 Single pellet reactor for the dynamic analysis of gas-solid reactions. 'Reaction of SO₂ with activated soda'

C. Di Blasi

- 2211 Heat transfer mechanisms and multi-step kinetics in the ablative pyrolysis of cellulose
- R. W. J. Westerhout, J. A. M. Kuipers and W. P. M. Van Swaaij
- 2221 Development, modelling and evaluation of a (laminar) entrained flow reactor for the determination of the pyrolysis kinetics of polymers
- J. W. Bolk, N. B. Siccama and K. R. Westerterp
- 2231 Flammability limits in flowing ethene-air-nitrogen mixtures: an experimental study

Runaway and Explosions

- C. Toulouse, J. Cezerac, M. Cabassud, M. V. Le Lann and G. Casamatta
- 2243 Optimisation and scale-up of batch chemical reactors.
 Impact of safety constraints
- U. Kammel, S. Schlüter, A. Steiff and P.-M. Weinspach
- 2253 Control of runaway polymerization reactions by injection of inhibiting agents—a contribution to the safety of chemical reactors

Fractal Modelling of Catalysts

- S. P. Rigby and L. F. Gladden
- 2263 NMR and fractal modelling studies of transport in porous
- M. Giona, W. A. Schwalm, A. Adrover and M. K. Schwalm
- 2273 First-order kinetics in fractal catalysts. Renormalization analysis of the effectiveness factor
- M. O. Coppens and G. F. Froment
- 2283 Fractal aspects in the catalytic reforming of naphtha
- P. Mougin, M. Pons and J. Villermaux
- 2293 Reaction and diffusion at an artificial fractal interface: evidence for a new diffusional regime

Biochemical Reaction Engineering

- An-Ping Zeng and W.-D. Deckwer
- 2305 Bioreaction techniques under microaerobic conditions: from molecular level to pilot plant reactors
- L. A. M. Van Der Wielen, P. J. Diepen, J. Houwers and K. Ch. A. M. Luyben
- 2315 A countercurrent adsorptive reactor for acidifying bioconversions

2327 Coupled nitrification-denitrification processes in a mixed B. Tartakovsky, E. Kotlar culture of coimmobilized cells: analysis and experiment and M. Sheintuch P. Gros, A. Bergel and M. Comtat 2337 Electrochemically assisted catalyst for enzymatic glucose oxidation Novel Processes I. Miracca, L. Tagliabue 2349 Multitubular reactors for etherifications and R. Trotta K. Sundmacher and U. Hoffmann 2359 Development of a new catalytic distillation process for fuel ethers via a detailed nonequilibrium model M. C. Clark and B. Subramaniam 2369 1-Hexene isomerization on a Pt/γ-Al₂O₃ catalyst: the dramatic effects of feed peroxides on catalyst activity J.-P. Lange and P. J. A. Tijm 2379 Processes for converting methane to liquid fuels: economic screening through energy management Reactor Operation and Optimization 2391 Convective acceleration of mass transfer in three-phase J. C. Van Den Heuvel, I. Portegies Zwart systems by pressure oscillations and L. H. J. Vredenbregt F. Hopley, D. Glasser 2399 Optimal reactor structures for exothermic reversible and D. Hildebrandt reactions with complex kinetics T. Kirchner and G. Eigenberger 2409 Optimization of the cold-start behaviour of automotive catalysts using an electrically heated pre-catalyst P. L. Silveston 2419 Automotive exhaust catalysis. Is periodic operation beneficial? Transport and Reaction D. G. Vlachos 2429 Homogeneous-heterogeneous oxidation reactions over platinum and inert surfaces F. E. Kruis and L. Falk Mixing and reaction in a tubular jet reactor: a comparison of experiments with a model based on a prescribed PDF 2449 Are barium sulphate kinetics sufficiently known for testing M. Aoun, E. Plasari, R. David and J. Villermaux precipitation reactor models? Polymerization Reaction Engineering E. Topalis, P. Pladis, C. Kiparissides 2461 Dynamic modelling and steady-state multiplicity in high and I. Goossens pressure multizone LDPE autoclaves G. I. Litvinenko 2471 General theory of molecular weight distribution of polymers formed in continuous non-terminating catalytic polymerization accompanied by chain transfer reactions E. J. Troelstra, 2479 Radical addition polymerisation of acrylates in a Buss-L. L. V. Dierendonck, Kneader L. P. B. M. Janssen, S. Maeder and A. Renken **Bubble Column Reactors**

2491 The effect of bubbling regime on gas and liquid phase

mixing in bubble column reactors

J. Zahradník and M. Fialová

- J. Reese, P. Jiang and L.-S. Fan
- 2501 Bubble characteristics in three-phase systems used for pulp and paper processing
- J. S. Groen, R. G. C. Oldeman, R. F. Mudde and H. E. A. Van Den Akker
- 2511 Coherent structures and axial dispersion in bubble column reactors

Number 11

SPECIAL ISSUE

ISCRE 14

CHEMICAL REACTION ENGINEERING: FROM FUNDAMENTALS TO COMMERCIAL PLANTS AND PRODUCTS

PART B

Transport and Reaction 2523 Deactivation model for textural effects on kinetics of N. Yasyerli, T. Doğu, G. Doğu gas-solid noncatalytic reactions 'char gasification with and I. Ar Simultaneous chlorination and sulphation of calcined M. Matsukata, K. Takeda, 2529 T. Miyatani and K. Ueyama limestone F. Valdivieso, M. Pijolat Kinetic study of a way of solid state synthesis of barium 2535 and M. Soustelle titanate W. Duo, N. F. Kirkby, J. P. K. Seville, J. H. A. Kiel, 2541 Kinetics of HCl reactions with calcium and sodium sorbents for IGCC fuel gas cleaning A. Bos and H. Den Uil 2547 On the confluence of dissolution, reaction and B. Zare Nezhad, M. Manteghian and N. S. Tavare precipitation: the case of boric acid production B. Dabir, M. R. Riazi 2553 Modelling of falling film reactors and H. R. Davoudirad Reactive distillation is an advanced technique of reaction A. V. Solokhin and S. A. Blagov 2559 process operation 2565 Kinetic modelling of batch precipitation reactions D. Mignon, T. Manth and H. Offermann T. Manth, D. Mignon 2571 Experimental investigation of precipitation reactions and H. Offermann under homogeneous mixing conditions I. Portugal, J. Vital and L. S. Lobo 2577 Isomerization of resin acids during pine oleoresin distillation W. L. M. Weerts, 2583 A laboratory reactor for kinetic studies of gas-solid M. H. J. M. de Croon reactions at low pressures: design and modelling in the and G. B. Marin presence of irreducible transport phenomena T. J. Hsu, C. Y. Mou and D. J. Lee 2589 Macromixing effects on the Gray-Scott model in a stirred reactor M. L. J. Van Leeuwen, 2595 Influence of mixing on the product quality in precipitation O. S. L. Bruinsma and G. M. Van Rosmalen

P. C. Chang, C. Y. Mou and D. J. Lee	2601	Micromixing effects in a stirred tank: the random replacement IEM model
P. Nadeau, D. Berk and R. J. Munz	2607	Measurement of residence time distribution by laser absorption spectroscopy
V. A. Kaminsky, A. B. Rabinovich and A. Ya. Fedorov	2613	Modelling of turbulent micromixing for two independent variables
M. J. W. Frank, J. A. M. Kuipers and W. P. M. Van Swaaij	2619	Experimental validation of the Maxwell-Stefan theory for the description of liquid-side mass transfer in a binary mixture—ammonia absorption in water using a stirred cell
H. Dhaouadi, S. Poncin, J. M. Hornut, G. Wild and P. Oinas	2625	Hydrodynamics of an airlift reactor: experiments and modeling
Y. Q. Cui, R. G. J. M. Van Der Lans and K. Ch. A. M. Luyben	2631	Local power uptake in gas-liquid systems with single and multiple Rushton turbines
V. V. Ranade	2637	Towards better mixing protocols by designing spatially periodic flows: the case of a jet mixer
R. A. Bakker and H. E. A. Van Den Akker	2643	A Lagrangian description of micromixing in a stirred tank reactor using 1D-micromixing models in a CFD flow field
D. Thomas and J. Vanderschuren	2649	The absorption-oxidation of NO _x with hydrogen peroxide for the treatment of tail gases
Gy. Marton, T. Szánya, L. Hanák, G. Simon, J. Hideg, J. Makai and J. Schunk	2655	Purification of nuclear power plant decontamination solutions by preparative scale reactive adsorption
N. K. Kimm, F. Berruti and T. S. Pugsley	2661	Modeling the hydrodynamics of downflow gas-solids reactors
J. Hinderer and F. J. Keil	2667	Three-dimensional Monte Carlo calculations of diffusion and reaction phenomena in zeolites
X. Fang and D. J. Gunn	2673	Ternary diffusion and flow in steam reforming catalysts
IM. Lee, WC. Wang, G. W. Neudeck and C. G. Takoudis	2681	Kinetics and modeling of low pressure chemical vapor deposition of $Si_{1-x}Ge_x$ epitaxial thin films
D. Chen, H. P. Rebo, K. Moljord and A. Holmen	2687	Effect of coke deposition on transport and adsorption in zeolites studied by a new microbalance reactor
Jinghai Li, Lixiong Wen, Guihua Qian, Heping Cui, Mooson Kwauk, J. C. Schouten and C. M. Van Den Bleek	2693	Structure heterogeneity, regime multiplicity and nonlinear behavior in particle-fluid systems
Biochemical and Polym	er Reac	tion Engineering. Multi-Phase Flow Reactors
R. L. Sonolikar and T. B. M. L. Raja Rao	2701	Effective interfacial area in a magnetically stabilized slurry bubble column
A. M. Thanos, P. A. Galtier and N. G. Papayannakos	2709	Liquid flow non-idealities and hold-up in a pilot scale packed bed reactor with cocurrent gas-liquid upflow
Xiao-Xiong Lu, A. P. Boyes and J. M. Winterbottom	2715	Study of mass transfer characteristics of a cocurrent downflow bubble column reactor using hydrogenation of itaconic acid
Yuanxin Wu, M. H. Al-Dahhan, M. R. Khadilkar and M. P. Dudukovic	2721	Evaluation of trickle bed reactor models for a liquid limited reaction

CVIII	-	ist of contents
N. J. M. Kuipers, E. J. Stamhuis and A. A. C. M. Beenackers	2727	Fluidization of potato starch in a stirred vibrating fluidized bed
A. Burghardt and G. Bartelmus	2733	Hydrodynamics and mass transfer in three-phase cocurrent reactors
M. G. Gómez, Z. Alarcón, E. Parra, S. Siquier, F. Pironti and A. E. Sáez	2739	Hydrodynamics of semibatch slurry bubble columns with polymer solutions
Jicheng Bi and T. Kojima	2745	Prediction of temperature and composition in a jetting fluidized bed coal gasifier
T. S. Pugsley and F. Berruti	2751	The circulating fluidized bed catalytic reactor: reactor model validation and simulation of the oxidative coupling of methane
D. M. Tsangaris and B. C. Baltzis	2757	Evaluation of batch and semi-batch reactor operation for enzymatic reactions with inhibitory kinetics
P. E. A. Rots, R. F. Mudde, H. E. A. Van Den Akker, T. H. J. J. Van Der Hagen and H. Van Dam	2763	Fluidized bed nuclear fission reactor
M. Matsukata, T. Matsushita and K. Ueyama	2769	A novel hydrogen/syngas production process: catalytic activity and stability of Ni/SiO ₂
A. A. Arest-Yakubovich, I. V. Zolotareva, N. I. Pakuro, B. I. Nakhmanovich and V. S. Glukhovskoi	2775	Synthesis of high-vinyl polymers and copolymers of butadiene on the basis of a new soluble organosodium catalyst
I. Saenz de Buruaga, M. Arotçarena,P. D. Armitage, L. M. Gugliotta,J. R. Leiza and J. M. Asua	2781	On-line calorimetric control of emulsion polymerization reactors
F. H. A. M. Van Den Boomen, J. Meuldijk and D. Thoenes	2787	Continuous emulsion copolymerisation of styrene and methyl acrylate
J. A. Feliu, C. Sottile, C. Bassani, J. Ligthart and G. Maschio	2793	Thermal characterization of the polymerization of methyl methacrylate
J. Lehtonen, K. Immonen, T. Salmi, E. Paatero and P. Nyholm	2799	Kinetic analysis of the reaction network in the catalyzed polyesterification of unsaturated carboxylic acids
S. F. Sodero, F. Berruti and L. A. Behie	2805	Ultrapyrolytic cracking of polyethylene—a high yield recycling method
J. R. Gonzalez-Velasco, J. A. Gonzalez-Marcos and J. A. Delgado	2811	Effect of molecular weight and presence of antioxidant in thermooxidative degradation of poly(2-hexyne) films
Y. Ikushima, N. Saito, K. Hatakeda and O. Sato	2817	Promotion of a lipase-catalyzed esterification in super- critical carbon dioxide in the near-critical region
F. Cioci and R. Lavecchia	2823	An innovative extracorporeal membrane system for enzyme-mediated blood purification
P. A. Fitzgerald	2829	Comprehensive monitoring of a fluidised bed reactor for anaerobic treatment of high strength wastewater
M. L. G. C. Araujo, R. P. Oliveira, R. C. Giordano and C. O. Hokka	2835	Comparative studies on cephalosporin C production process with free and immobilized cells of Cephalosporium acremonium ATCC 48272

T. Garcia, A. Coteron, M. Martinez and J. Aracil	2841	Kinetic modelling of esterification reactions catalysed by immobilized lipases
F. Shiraishi, T. Hasegawa, S. Kasai, N. Makishita and H. Miyakawa	2847	Characteristics of apparent kinetic parameters in a packed-bed immobilized enzyme reactor
G. Sassi, B. Ruggeri, F. Bosco and V. Specchia	2853	Relaxation time analysis of a rotating biological contactor
J. A. D. Rodrigues and R. Maciel Filho	2859	Optimal feed rates strategies with operating constraints for the penicillin production process
R. Kikuchi, A. Tsutsumi and K. Yoshida	2865	Fractal aspect of hydrodynamics in a three-phase fluidized bed

Kinetics. Novel Reactors or Processes

F. Döbert and J. Gaube	2873	Kinetics and reaction engineering of selective hydro- genation of benzene towards cyclohexene
J. Goetz, D. Yu. Murzin, M. Ulischenko and R. Touroude	2879	Kinetics of buta-1,3-diene hydrogenation over palladium catalysts
H. de Lasa, L. Hagey, S. Rong and A. Pekediz	2885	Compound catalyst for high yields of olefins from synthesis gas. Catalytic reaction steps
G. Maria, A. Marin, C. Wyss, S. Muller and E. Newson	2891	Modelling and scaleup of the kinetics with deactivation of methylcyclohexane dehydrogenation for hydrogen energy storage
R. Willi, B. Roduit, R. A. Koeppel, A. Wokaun and A. Baiker	2897	Selective reduction of NO by NH ₃ over vanadia-based commercial catalyst: parametric sensitivity and kinetic modelling
B. J. McCoy	2903	Continuous kinetics of cracking reactions: thermolysis and pyrolysis
B. Krüger, H. Ziemer, M. Mertl and Th. Bayer	2909	Evaluation of kinetic data with an automatically working laboratory unit
M. D. Gluz and J. C. Merchuk	2915	Modified airlift reactors: the helical flow promoters
C. O. Rouiller and J. M. Assaf	2921	Study on the effect of preparation variables of Ni/Al ₂ O ₃ catalysis by experimental planning
M. Pedernera, D. O. Borio and J. A. Porras	2927	A new cocurrent reactor for ammonia synthesis
S. Porchet, L. Kiwi-Minsker, R. Doepper and A. Renken	2933	Catalyst development for the selective methylation of catechol
O. H. J. Muhammad and E. K. T. Kam	2939	Modelling and experimental studies of coking in a structured catalyst
A. V. Kruglov, M. C. Bjorklund and R. W. Carr	2945	Optimization of the simulated countercurrent moving-bed chromatographic reactor for the oxidative coupling of methane
Haiming Lai and Chengyue Li	2951	Application of periodic reversal flow reactors to chemical heat pump systems based on solid/vapor non-catalytic reaction
M. S. McCutchen, M. A. Márquez and G. W. Roberts	2959	Alcohol synthesis with Zn/Cr catalysts in a slurry reactor

E. Tronconi, L. Lietti, P. Forzatti and S. Malloggi	2965	Experimental and theoretical investigation of the dynamics of the SCR-DeNO _x reaction
M. Kawase, T. B. Suzuki, K. Inoue, K. Yoshimoto and K. Hashimoto	2971	Increased esterification conversion by application of the simulated moving-bed reactor
S. H. Yang, X. Z. Wang and C. McGreavy	2977	A multivariable coordinated control system based on predictive control strategy for FCC reactor-regenerator system
B. H. Chen, Q. L. Dai and D. W. Lu	2983	Development and modeling of a loop fluidized bed reactor with baffle for propylene ammoxidation
A. N. Zagoruiko, O. V. Kostenko and A. S. Noskov	2989	Development of the adsorption-catalytic reverse-process for incineration of volatile organic compounds in diluted waste gases
J. Wei	2995	Adsorption and cracking of N-alkanes over ZSM-5: negative activation energy of reaction
A. G. Gayubo, P. L. Benito, A. T. Aguayo, M. Castilla and J. Bilbao	3001	Kinetic model of the MTG process taking into account the catalyst deactivation. Reactor simulation
A. Liepold, K. Roos and W. Reschetilowski	3007	Mesoporous MCM-41 materials—effect of acidity and porosity on catalytic properties
P. Costamagna, E. Arato, P. L. Antonucci and V. Antonucci	3013	Partial oxidation of CH ₄ in solid oxide fuel cells: simulation model of the electrochemical reactor and experimental validation
H. A. Smits, A. Stankiewicz, W. Ch. Glasz, T. H. A. Fogl and J. A. Moulijn	3019	Selective three-phase hydrogenation of unsaturated hydrocarbons in a monolithic reactor
K. Kusakabe, S. Yokoyama, S. Morooka, Ji. Hayashi and H. Nagata	3027	Development of supported thin palladium membrane and application to enhancement of propane aromatization on Ga-silicate catalyst
M. Horio, A. Saito, K. Unou, H. Nakazono, N. Shibuya, S. Shima and A. Kosaka	3033	Synthesis of diamond particles with an acetylene fired circulating fluidized bed
M. P. Helmsing, M. Makkee and J. A. Moulijn	3039	Short contact time experiments in a novel benchscale FCC riser reactor
E. Gobina and R. Hughes	3045	Reaction coupling in catalytic membrane reactors
A. L. Y. Tonkovich, D. M. Jimenez, J. L. Zilka and G. L. Roberts	3051	Inorganic membrane reactors for the oxidative coupling of methane
Re	actor N	Iodelling and Simulation
Dong Hyun Kim, M. S. Wainwright, Kun Soo Chang and Guoyu Ma	3059	
A. A. Shaikh and S. M. Zarook	3065	A modelling analysis of non-isothermal bubble column reactors
Liang-Hong Liu, Xing-Gui Zhou and Wei-Kang Yuan	3071	A new on-line parameter estimation strategy for fixed-bed reactors

3077

J. Adanez, P. Gayan and L. F. de Diego

Modelling and simulation of the sulphur retention in circulating fluidized bed combustors

		ast of Contents
M. S. Kulkarni and M. P. Duduković	3083	Dynamics of gas phase and solid phase reactions in fixed bed reactors
M. A. Alós, F. Strozzi and J. M. Zaldívar	3089	A new method for assessing the thermal stability of semibatch processes based on Lyapunov exponents
J. J. Heiszwolf and J. M. H. Fortuin	3095	Runaway behaviour and parametric sensitivity of a batch reactor—an experimental study
Gh. Juncu, J. P. Brouwer and A. Mulder	3101	Sensitivity analysis of the methane catalytic combustion in a sintered metal reactor with integrated heat exchanger
E. M. Assaf, R. C. Giordano and C. A. O. Nascimento	3107	Thermal runaway of ethylene oxidation reactors: prevision through neuronal networks
G. Deerberg, S. Schlüter, A. Steiff and W. Witt	3113	Simulation of operational failures in two-phase semibatch processes
C. M. S. G. Baptista and J. A. A. M. e Castro	3119	A contribution to the study of runaway and parametric sensitivity in fixed bed catalytic reactors
M. Berezowski and A. Burghardt	3125	Control of tubular adiabatic homogeneous reactor with recycle for global stabilization of locally stable and unstable steady states
A. Tietze, I. Lüdke and KH. Reichert	3131	Temperature oscillation calorimetry in stirred tank reactors
E. Miklovicova, M. A. Latifi, M. M'Saad and I. Hejda	3139	PID adaptive control of the temperature in batch and semi-batch chemical reactors
J. Hanika and R. Lange	3145	Dynamic aspects of adiabatic trickle bed reactor control near the boiling point of reaction mixture
L. Pellegrini and C. Tablino Possio	3151	A non-ideal CSTR: a high codimension bifurcation analysis
P. Pinkas, D. Šnita, M. Kubíček and M. Marek	3157	Modelling of spatiotemporal patterns in a sequence of catalytic monolith reactors
Z. Louleh, M. Cabassud, M. V. Le Lann, A. Chamayou and G. Casamatta	3163	A new heating-cooling system to improve controllability of batch reactors
R. J. Brandi, O. M. Alfano and A. E. Cassano	3169	Modeling of radiation absorption in a flat plate photo- catalytic reactor
E. Panagos, I. Voudouris and M. Stoukides	3175	Modelling of equilibrium limited hydrogenation reactions carried out in H ⁺ conducting solid oxide membrane reactors
A. Meier, J. Ganz and A. Steinfeld	3181	Modeling of a novel high-temperature solar chemical reactor
L. Mleczko, T. Ostrowski and T. Wurzel	3187	A fluidised-bed membrane reactor for the catalytic partial oxidation of methane to synthesis gas

Number 12

iii Comment

O. D. Crisalle and R. K. Ballamudi 3193 Robust pole-placement technique for plants with ellipsoidally uncertain parameters

V. Linek, T. Moucha and J. Sinkule	3203	Gas-liquid mass transfer in vessels stirred with multiple impellers—I. Gas-liquid mass transfer characteristics in individual stages
F. Griolet, J. Lieto and G. Astarita	3213	Containment of phosgene accidental release—kinetics of phosgene absorption in sodium hydroxide solution
M. Zerfa and B. W. Brooks	3223	Prediction of vinyl chloride drop sizes in stabilised liquid-liquid agitated dispersion
Xing Zhong, Yu-Xin Wang and Shi-Chang Wang	3235	Pressure dependence of the volume phase-transition of temperature-sensitive gels
K. P. Galvin	3241	Measurement of particle velocity during sediment consolidation
G. M. Kontogeorgis, E. C. Voutsas and D. P. Tassios	3247	A molecular simulation-based method for the estimation of activity coefficients for alkane solutions
L. Zhang and N. A. Seaton	3257	Simulation of catalyst fouling at the particle and reactor levels
J. A. P. Coutinho, K. Knudsen, S. I. Andersen and E. H. Stenby	3273	A local composition model for paraffinic solid solutions
S. Brandani	3283	Analytical solution for ZLC desorption curves with bi-porous adsorbent particles
Cheng-Yu Ning, Chin-Chin Tsai and Ta-Jo Liu	3289	The effect of polymer additives on extrusion slot coating
R. Pal	3299	Viscoelastic properties of polymer-thickened oil-in-water emulsions
A. Burghardt and M. Berezowski	3307	Analysis of the bifurcation of oscillatory solutions in a porous catalytic pellet: influence of the reaction order
G. Vázquez, G. Antorrena, J. M. Navaza and V. Santos	3317	Absorption of CO ₂ by water and surfactant solutions in the presence of induced Marangoni effect
Zhong-Xiang Zhu and A. Jutan	3325	Loop decomposition and dynamic interaction analysis of decentralized control systems
L. J. Broadbelt and J. E. Rekoske	3337	Necessary levels of detail in microkinetic models of catalytic reactions on nonuniform surfaces
P. Gerard, G. Segantini and J. Vanderschuren	3349	Modeling of dilute sulfur dioxide absorption into calcium sulfite slurries
C. M. Crowe	3359	Formulation of linear data reconciliation using information theory
Z. Alarcón, E. Parra, M. G. Gómez, S. Siquier and A. E. Sáez	3367	Shorter Communication Phase distributions in semibatch slurry bubble columns with guar gum solutions

Number 13

and B. J. Bellhouse	3373	Observation of concentration dispersion in unsteady deflected flows
C. J. Franzén, E. Albers and C. Niklasson	3391	Use of the inlet gas composition to control the respiratory quotient in microaerobic bioprocesses

	L	ist of Contents xxiii
K. P. Möller and C. T. O'Connor	3403	The measurement of diffusion in porous catalysts using a CSTR
Xiaohua Yi, K. S. Shing and M. Sahimi	3409	Molecular simulation of adsorption and diffusion in pillared clays
A. Lawal	3427	Convective diffusion of power law fluids inside ducts with consecutive homogeneous and catalytic wall reactions
M. J. J. Mayer, J. Meuldijk and D. Thoenes	3441	Application of the plug flow with axial dispersion model for continuous emulsion polymerization in a pulsed packed column
A. Lund, O. Urdahl and S. S. Kirkhorn	3449	Inhibition of gas hydrate formation by means of chemical additives—II. An evaluation of the screening method
A. J. O'Connor, H. R. C. Pratt and G. W. Stevens	3459	Electrophoretic mobilities of proteins and protein mixtures in porous membranes
S. J. L. Rix, D. H. Glass and C. A. Greated	3479	Preliminary studies of elutriation from gas-fluidised beds using particle image velocimetry
P. Adomeit and U. Renz	3491	Deposition of fine particles from a turbulent liquid flow: experiments and numerical predictions
M. Sugaya and Y. H. Mori	3505	Behavior of clathrate hydrate formation at the boundary of liquid water and a fluorocarbon in liquid or vapor state
R. Gutsche and K. Hartmann	3519	Generalized criteria for predicting the dynamics of continuous-flow chemical systems—I. Application to adsorber systems
R. Gutsche and K. Hartmann	3537	Generalized criteria for predicting the dynamics of continuous-flow chemical systems—II. Application to chemical reactors
T. Akiyama, K. M. Aoki, T. Iguchi and K. Nishimoto	3551	Shorter Communication A fractal property of vertically vibrated beds of granules
		Number 14
M. Ciofalo, A. Brucato, F. Grisafi and N. Torraca	3557	Turbulent flow in closed and free-surface unbaffled tanks stirred by radial impellers
TI Pannel and I. Misselve	2000	

M. Ciofalo, A. Brucato, F. Grisafi and N. Torraca	3557	Turbulent flow in closed and free-surface unbaffled tanks stirred by radial impellers
U. Pannek and L. Mleczko	3575	Comprehensive model of oxidative coupling of methane in a fluidized-bed reactor
M. Zerfa and B. W. Brooks	3591	Vinyl chloride dispersion with relation to suspension polymerisation
V. S. Chakravarthy and J. M. Ottino	3613	Mixing of two viscous fluids in a rectangular cavity
Dongming Li	3623	Coalescence between small bubbles: effects of bulk and surface diffusion
M. D. Pritzker	3631	Shrinking-core model for systems with facile hetero- geneous and homogeneous reactions

List of Contents

xxiv	L	ist of Contents
D. E. Smiles, J. M. Kirby and I. P. Little	3647	Hydrodynamic dispersion and chemical reaction in sodium bentonite during filtration in the presence of calcium sulphate
V. T. Popa and J. A. Schwarz	3657	Two-step sequences with extended Temkin nonuniform reactivity—rate-determining step revisited
G. Shen and J. A. Finch	3665	Bubble swarm velocity in a column
K. Thomsen, P. Rasmussen and R. Gani	3675	Correlation and prediction of thermal properties and phase behaviour for a class of aqueous electrolyte systems
D. M. Ginter and S. K. Loyalka	3685	Apparent size-dependent growth in aggregating crystallizers
R. O. Idem and N. N. Bakhshi	3697	Kinetic modeling of the production of hydrogen from the methanol-steam reforming process over Mn-promoted coprecipitated Cu-Al catalyst
	1	Number 15
S. Siemund, J. P. Leclerc, D. Schweich, M. Prigent and F. Castagna	3709	Three-way monolithic converter: simulations versus experiments
G. Urrutia, P. Bonelli, M. C. Cassanello and A. L. Cukierman	3721	On dynamic liquid holdup determination by the drainage method
A. P. Duvedi and L. E. K. Achenie	3727	Designing environmentally safe refrigerants using mathematical programming
E. Reverchon and M. Poletto	3741	Mathematical modelling of supercritical CO ₂ fractionation of flower concretes
M. A. Mendes-Tatsis and E. S. Perez de Ortiz	3755	Marangoni instabilities in systems with an interfacial chemical reaction
K. Fotouh and K. Shukla	3763	A comparative study of numerical methods for calculating phase equilibria in fluid mixtures from an equation of state
Yizhou Zheng and Tingyue Gu	3773	Analytical solution to a model for the startup period of fixed-bed reactors
D. Tondeur, H. Kabir, L. A. Luo and J. Granger	3781	Multicomponent adsorption equilibria from impulse response chromatography
B. C. Baltzis, D. M. Tsangaris and KW. Wang	3801	Utilization of substitutable substrates in a bioreactor under cycling: a study on process dynamics and optimization
A. S. Lamine, L. Gerth, H. Le Gall and G. Wild	3813	Heat transfer in a packed bed reactor with cocurrent downflow of a gas and a liquid
Hui-Bo Lu, N. Mazet and B. Spinner	3829	Modelling of gas-solid reaction—coupling of heat and mass transfer with chemical reaction

3847

tography

L. Barna, J. M. Blanchard, E. Rauzy, C. Berro and P. Moszkowicz

C. A. Brooks and S. M. Cramer

3861 Thermodynamic and kinetic parameters for the supercritical extraction of biphenyl from a contaminated soil

Solute affinity in ion-exchange displacement chroma-

		AA
V. Linek, T. Moucha and J. Sinkule	3875	Gas-liquid mass transfer in vessels stirred with multiple impellers—II. Modelling of gas-liquid mass transfer
I. Devotta and R. A. Mashelkar	3881	Shorter Communication On optimal temperature for dissolution of polymers in hydrogen bonding solvents
W. E. Stewart	3887	Letter to the Editor Additional comments on the article "Solution of boundary-value problems by orthogonal collocation"
		Number 16
A. Lancia, D. Musmarra and F. Pepe	3889	Uncatalyzed heterogeneous oxidation of calcium bisulfite
M. A. Koenders and R. J. Wakeman	3897	The initial stages of compact formation from suspensions by filtration
D. Sasongko and J. F. Stubington	3909	Significant factors affecting devolatilization of frag- menting, non-swelling coals in fluidized bed combustion
R. Ó Meadhra and G. M. Van Rosmalen	3919	Modelling of the growth of ammonium sulphate crystals in a DTB crystallizer
S. B. M. Moreea and R. M. Nedderman	3931	Exact stress and velocity distributions in a cohesionless material discharging from a conical hopper
R. Ó Meadhra and G. M. Van Rosmalen	3943	Scale-up of ammonium sulphate crystallization in a DTB crystallizer
Chuei-Tin Chang and Jin-Ru Hwang	3951	A multiobjective programming approach to waste minimization in the utility systems of chemical processes
G. R. Watson and J. M. Rotter	3967	A finite element kinematic analysis of planar granular solids flow
D. G. Vlachos	3979	Reduction of detailed kinetic mechanisms for ignition and extinction of premixed hydrogen/air flames
N. W. Loney	3995	Analytical solution to mass transfer in laminar flow in hollow fiber with heterogeneous chemical reaction
Y. Tan and T. C. Tan	4001	Modelling and sensing characteristics of an amperometric hydrocarbon sensor
L. K. Filippov	4013	Multicomponent adsorption dynamics of polymers in a fixed bed
B. P. Russell and M. D. LeVan	4025	Group-contribution theory for adsorption of gas mixtures on solid surfaces
Guo-Hua Xiu	4039	Shorter Communication Modeling breakthrough curves in a fixed bed of activated carbon fiber—exact solution and parabolic approximation
A. Burghardt	4043	Letters to the Editors Some comments on the paper "A pervaporation model: membrane design"
A. E. Fouda	4043	Reply to some comments on the paper "A pervaporation model: membrane design"

Number 17

Dejin Liu, Mooson Kwauk	4045	Aggregative and particulate fluidization—the two
and Hongzhong Li		extremes of a continuous spectrum
G. Reinhold, S. Merrath, F. Lennemann and H. Märkl	4065	Modelling the hydrodynamics and the liquid-mixing behaviour of a biogas tower reactor
P. Moszkowicz, L. Witzel and G. Claus	4075	Modelling of very fast pyrolysis of heavy fuel oil droplets
J. J. Nieuwland, M. L. Veenendaal, J. A. M. Kuipers and W. P. M. van Swaaij	4087	Bubble formation at a single orifice in gas-fluidised beds
Y. Zhu, R. G. Minet and T. T. Tsotsis	4103	A continuous pervaporation membrane reactor for the study of esterification reactions using a composite polymeric/ceramic membrane
Z. J. Grzywna	4115	Scaling in diffusive transport through membranes
Ka Kheng Tan and R. B. Thorpe	4127	The onset of convection caused by buoyancy during transient heat conduction in deep fluids
Dong Hyun Kim	4137	A new linear formula for cyclic adsorption in a particle
D. D. Do	4145	A model for surface diffusion of ethane and propane in activated carbon
F. Camacho-Rubio, E. Jurado-Alameda, P. González-Tello and G. Luzón González	4159	A comparative study of the activity of free and immobilized enzymes and its application to glucose isomerase
A. A. Boateng and P. V. Barr	4167	Modelling of particle mixing and segregation in the transverse plane of a rotary kiln
J. Alvarez-Ramírez, R. Suárez and R. Femat	4183	Control of continuous-stirred tank reactors: stabilization with unknown reaction rates
F. Cuadros and W. Okrasinski	4189	Vapour pressure curves obtained from different equations of state—a quantitative analysis
M. Łabęcki, B. D. Bowen and J. M. Piret	4197	Two-dimensional analysis of protein transport in the extracapillary space of hollow-fibre bioreactors
Hsiao-Kuo D. Hsuen	4215	Shorter Communication Effects of spatial discretization errors on the steady-state multiplicity of a one-dimensional tubular reactor model with intraparticle transport

Number 18

iii Comment

	111	Comment
D. Mantzavinos, A. G. Livingston, R. Hellenbrand and I. S. Metcalfe	4219	Wet air oxidation of polyethylene glycols; mechanisms, intermediates and implications for integrated chemical-biological wastewater treatment
K. Alejski and F. Duprat	4237	Dynamic simulation of the multicomponent reactive distillation

- E. Jamshidi and H. Ale Ebrahim 4253 An incremental analytical solution for gas-solid reactions, application to the grain model 4259 Hot spot formation on a catalyst M. Somani, M. A. Liauw and D. Luss 4271 The effect of dilution of the catalyst bed on its heat-M. Taniewski, A. Lachowicz, K. Skutil and D. Czechowicz transfer characteristics in oxidative coupling of methane W. A. Meetsma, A. C. Hoffmann 4279 Gravity-driven thickening in a long, vertical tube and E. L. Cox F. Hernáinz-Bermúdez De Castro, 4289 The effect of pH modifier on the flotation of celestite with M. Calero De Hoces sodium oleate and quebracho and A. Gálvez Borrego Y. G. Park 4295 Parameter study for separation design in a packed column Guoming Zhong and G. Guiochon 4307 Analytical solution for the linear ideal model of simulated moving bed chromatography W. R. Bowen, A. Mongruel 4321 Prediction of the rate of cross-flow membrane ultraand P. M. Williams filtration: a colloidal interaction approach S. Toppinen, J. Aittamaa 4335 Interfacial mass transfer in trickle-bed reactor modelling and T. Salmi J. Šťastová, J. Jež, M. Bártlová 4347 Rate of the vegetable oil extraction with supercritical and H. Sovová CO₂—III. Extraction from sea buckthorn G. Astarita 4353 Letter to the Editor Number 19 Ji-Wei Yu and I. Neretnieks 4355 Modelling of transport and reaction processes in a porous medium in an electrical field R. A. Białecki and T. Kruczek 4369 Frictional, diathermal flow of steam in a pipeline M. Raphael and S. Rohani 4379 Isoelectric precipitation of sunflower protein in an MSMPR precipitator: modelling of PSD with aggregation A. Brito, R. Arvelo, R. Villarroel, 4385 Coke and H/C ratio profiles on a Cr₂O₃/Al₂O₃ catalyst F. J. Garcia and M. T. Garcia during the butene-1 dehydrogenation reaction Shih-Yuan Lu and Jiann-Long Song Effect of interfacial characteristics on effective conductivities of composites containing randomly distributed aligned long fibers R. M. Hockey and J. M. Nouri 4405 Turbulent flow in a baffled vessel stirred by a 60° pitched blade impeller
 - C. S. Raymond and V. A. Volpert

 4443 Stability of uniformly propagating SHS waves in porous solids with melting and flow of reactants

S. Manjunath, K. S. Gandhi, R. Kumar and D. Ramkrishna

R. Pelton

4423 Precipitation in small systems—II. Mean field equations

4437 A model of foam growth in the presence of antifoam

more effective than population balance

xxviii		List of Contents
Ph. Jamet, D. Fargue and P. Costesèque	4463	Determination of the effective transport coefficients for the separation of binary mixtures of organic compounds into packed thermal diffusion columns
P. S. Williams, Myeong Hee Moon, Yuehong Xu and J. C. Giddings	4477	Effect of viscosity on retention time and hydrodynamic lift forces in sedimentation/steric field-flow fractionation
J. Membrez, P. P. Infelta and A. Renken	4489	Use of the Laplace transform technique for simple kinetic parameters evaluation. Application to the adsorption of a protein on porous beads
J. Singh and M. E. Weber	4499	Kinetics of one-dimensional gel swelling and collapse for large volume change
H. Berthiaux, C. Varinot and J. Dodds	4509	Approximate calculation of breakage parameters from batch grinding tests
H. Sheardown and YL. Cheng	4517	Mechanisms of corneal epithelial wound healing
R. P. Chhabra, P. H. T. Uhlherr and J. F. Richardson	4531	Shorter Communications Some further observations on the hindered settling velocity of spheres in the inertial flow regime
T. Kiljański and M. Dziubiński	4533	Resistance to flow of molten polymers through filtration screens
		Number 20
G. M. Crawley, F. Gruy and M. Cournil	4537	In-line study of crystal fragmentation in a stirred reactor
F. Takemura, Qiusheng Liu and A. Yabe	4551	Effect of density-induced natural convection on the absorption process of single bubbles under a plate
S. J. Parulekar and N. A. S. Amin	4561	Gas-liquid reactions in well-mixed reactors—a fresh perspective
I. Iliuta, F. C. Thyrion, O. Muntean	4579	Residence time distribution of the liquid in gas-liquid

and M. Giot cocurrent upflow fixed-bed reactors 4595 Modeling of biodegradation/adsorption combined pro-A. Leitão and A. Rodrigues cesses in fixed-bed biofilm reactors: effects of the intraparticle convective flow R. M. G. Able, S. M. Othen The exit time distribution during the batch discharge of 4605 and R. M. Nedderman a cylindrical bunker R. R. Iyer and D. W. Bousfield The leveling of coating defects with shear thinning 4611 rheology J. W. A. De Swart, R. E. van Vliet 4619 Size, structure and dynamics of "large" bubbles in a and R. Krishna two-dimensional slurry bubble column S. Brandani and G. Astarita 4631 Analysis of the discontinuities in magnetized bubbling fluidized beds S. Brandani, S. Rapagnà, 4639 Jump conditions for one-dimensional two-phase shock P. U. Foscolo and L. G. Gibilaro waves in fluidised beds: the effect of the jump in fluid pressure

Improvement of the floc resistance to a centrifugal shear

field by polymer adjunction

4649

M. Caron-Charles and J.-P. Gozlan

P. Duchêne and P. Rouchon	4661	Kinetic scheme reduction via geometric singular perturbation techniques
Xianshe Feng and R. Y. M. Huang	4673	Studies of a membrane reactor: esterification facilitated by pervaporation
S. P. Asprey, B. W. Wojciechowski, N. M. Rice and A. Dorcas	4681	Applications of temperature scanning in kinetic investigations: the hydrolysis of acetic anhydride
A. P. Hinderink, F. P. J. M. Kerkhof, A. B. K. Lie, J. de Swaan Arons and H. J. van der Kooi	4693	Exergy analysis with a flowsheeting simulator—I. Theory; calculating exergies of material streams
A. P. Hinderink, F. P. J. M. Kerkhof, A. B. K. Lie, J. de Swaan Arons and H. J. van der Kooi	4701	Exergy analysis with a flowsheeting simulator—II. Application; synthesis gas production from natural gas
M. Giona, W. A. Schwalm, M. K. Schwalm and A. Adrover	4717	Exact solution of linear transport equations in fractal media—I. Renormalization analysis and general theory
M. Giona, W. A. Schwalm, M. K. Schwalm and A. Adrover	4731	Exact solution of linear transport equations in fractal media—II. Diffusion and convection
A. Stoica-Guzun, C. Albulescu, Gh. Juncu and O. Floarea	4745	Shorter Communication Extraction of urea with liquid surfactant membranes in a batch system
		Number 21
M. Jobson, D. Hildebrandt and D. Glasser	4749	Variables indicating the cost of vapour-liquid equilibrium separation processes
D. G. Dixon	4759	The multiple convolution integral: a new method for modeling multistage continuous leaching reactors
J. S. Qi and C. Krishnan	4769	Mathematical modeling of continuous cross-flow diffusion-controlled dryers
T. Yamaguchi, C. A. Koval, R. D. Noble and C. N. Bowman	4781	Transport mechanism of carbon dioxide through per- fluorosulfonate ionomer membranes containing an amine carrier
Zhen-Min Cheng and Wei-Kang Yuan	4791	Simultaneous estimation of kinetic and heat transfer parameters of a wall-cooled fixed-bed reactor
Genyuan Li and H. Rabitz	4801	Combined symbolic and numerical approach to constrained nonlinear lumping—with application to an H_2/O_2 oxidation model
H. Sharifi and J. M. Shaw	4817	Secondary drop production in packed-bed coalescers
DJ. Kim, J. M. Caruthers and N. A. Peppas	4827	Experimental verification of a predictive model of penetrant transport in glassy polymers
Yu. A. Buyevich and B. W. Webbon	4843	Bubble formation at a submerged orifice in reduced gravity
J. J. Zacca, J. A. Debling and W. H. Ray	4859	Reactor residence time distribution effects on the multi- stage polymerization of olefins—I. Basic principles and illustrative examples, polypropylene
S. Trinh and D. Ramkrishna	4887	Pattern formation in fixed bed catalytic reactors—I

M. Giona, A. Adrover,

W. A. Schwalm and M. K. Schwalm

List of Contents 4903 The direct calculation of periodic states of the reverse flow A. G. Salinger and G. Eigenberger reactor—I. Methodology and propane combustion results A. G. Salinger and G. Eigenberger 4915 The direct calculation of periodic states of the reverse flow reactor—II. Multiplicity and instability Thermodynamic properties of ternary fluid mixtures from K. Fotouh and K. Shukla the improved perturbation theory and van der Waals one-fluid theory-I. Model mixtures K. Fotouh and K. Shukla 4933 Thermodynamic properties of ternary fluid mixtures from the improved perturbation theory and van der Waals one-fluid theory-II. Real mixtures Crystallization and precipitation engineering—VII. The modelling of sodium perborate tetrahydrate R. David and J.-M. Bossoutrot 4939 crystallization from solution I Announcement Number 22 E. Sørensen and S. Skogestad 4949 Comparison of regular and inverted batch distillation H. D. Nguyen, S. Paik, 4963 Unsteady non-Darcy reaction-driven flow from an R. W. Douglass and I. Pop anistropic cylinder in porous media H. Teng, A. Yamasaki Stability of the hydrate layer formed on the surface of a and Y. Shindo CO₂ droplet in high-pressure, low-temperature water I. Iliuta, F. C. Thyrion 4987 Hydrodynamic characteristics of two-phase flow through fixed beds: air/Newtonian and non-Newtonian liquids and O. Muntean J. Valha and J. Kubie Stability of a gas-liquid interface in a periodic vertical motion R. Font and M. L. Laveda 5007 Design method of continuous thickeners from semi-batch tests of sedimentation M. Shapiro, R. Fedou, J.-F. Thovert 5017 Coupled transport and dispersion of multi-component and P. M. Adler reactive solutes in rectilinear flows Wangqi Hou and 5043 Stability of water-in-oil-in-water type globules K. D. Papadopoulos M.-C. Fournier, L. Falk 5053 A new parallel competing reaction system for assessing and J. Villermaux micromixing efficiency-experimental approach

Number 23

Exact solution of linear transport equations in fractal

media—III. Adsorption and chemical reaction

iii Editorial

5065

K. Elgeti	5077	A new equation for correlating a pipe flow reactor with a cascade of mixed reactors	
A. Stergaršek, R. Kocjančič and M. Gerbec	5081	Experimental determination and modelling of the absorption of SO ₂ into a single drop based on pH measurement	

F. H. Arnold	5091	Directed evolution: creating biocatalysts for the future
A. R. Kleinig and A. P. J. Middelberg	5103	The correlation of cell disruption with homogenizer valve pressure gradient determined by computational fluid dynamics
R. Semiat, E. Leshinski and A. Orell	5111	Laser grating technique for measurement of local velocity of large drops and jets in liquid-liquid systems
N. Régnier, G. Defaye, L. Caralp and C. Vidal	5125	Software sensor based control of exothermic batch reactors
W. Kvasnak and G. Ahmadi	5137	Deposition of ellipsoidal particles in turbulent duct flows
M. F. Llop, F. Madrid, J. Arnaldos and J. Casal	5149	Fluidization at vacuum conditions. A generalized equation for the prediction of minimum fluidization velocity
Chien-Chong Chen, Chun-Chong Fu and Chong-Hung Tsai	5159	Stabilized chaotic dynamics of coupled nonisothermal CSTRs
J. B. Laurindo and M. Prat	5171	Numerical and experimental network study of evaporation in capillary porous media. Phase distributions
MC. Fournier, L. Falk and J. Villermaux	5187	A new parallel competing reaction system for assessing micromixing efficiency—determination of micromixing time by a simple mixing model
F. Bohin, I. Manas-Zloczower and D. L. Feke	5193	Kinetics of dispersion for sparse agglomerates in simple shear flows: application to silica agglomerates in silicone polymers
N. J. Rivette and J. C. Baygents	5205	A note on the electrostatic force and torque acting on an isolated body in an electric field
Ch. Nicole, F. Patisson, D. Ablitzer and JL. Houzelot	5213	A thermogravimetric study of the kinetics of hydro- fluorination of uranium dioxide
V. Linek, P. Havelka and J. Sinkule	5223	Shorter Communications Supersaturation effect in steady-state and dynamic methods for measuring $k_L a$ in gas-liquid dispersions
K. Wichterle, V. Sobolík, M. Lutz and V. Denk	5227	Shear rate on centrifugal pump impeller
M. Hartman, O. Trnka, V. Veselý and K. Svoboda	5229	Predicting the rate of thermal decomposition of dolomite
Corrigendum	5233	
Erratum	5235	
Erratum	5239	
		Number 24
	iii	Comment

0.0.0	~
111	Comment

S. Assabumrungrat and D. A. White	5241	Permeation of ethanol and methanol vapours throug a porous alumina membrane
D. M. J. Puchyr, A. K. Mehrotra, L. A. Behie and N. Kalogerakis	5251	Hydrodynamic and kinetic modelling of circulating fluidized bed reactors applied to a modified Claus plan

:,

List of Contents

B. Niemeyer, T. Feilenreiter and H. Tiltscher	5263	Theoretical studies on biospecific adsorption for large- scale affinity separations
P. J. G. Huttenhuis, J. A. M. Kuipers and W. P. M. van Swaaij	5273	The effect of gas-phase density on bubble formation at a single orifice in a two-dimensional gas-fluidized bed
G. Saracco, S. Specchia and V. Specchia	5289	Catalytically modified fly-ash filters for NO_x reduction with NH_3
D. S. Vaidya, J. M. Nitsche, S. L. Diamond and D. A. Kofke	5299	Convection-diffusion of solutes in media with piecewise constant transport properties
A. Mate, J. Morchain, O. Masbernat and C. Gourdon	5313	A transient method for the study of wetting in a liquid-liquid contactor
J. L. Castillo and D. E. Rosner	5325	Role of high activation energy homogeneous chemical reactions in affecting CVD-rates and deposit quality for heated surfaces
L. M. Sun, P. Le Queré and M. D. Levan	5341	Numerical simulation of diffusion-limited PSA process models by finite difference methods
		Shorter Communications
R. P. Chhabra, A. McKay and P. Wong	5353	Drag on discs and square plates in pseudoplastic polymer solutions
Meng-Shyang Fu and Chung-Sung Tan	5357	Liquid holdup and axial dispersion in trickle-bed reactors
Erratum	5363	

AUTHOR INDEX

Able R. M. G. 4605 Ablitzer D. 5213 Achenie L. E. K. 3727 Adanez J. 3077 Adler P. M. 5017 Adomeit P. 3491 Adrover A. 2273, 4717, 4731, 5065 Agarwal P. K. 1133 Agrawal R. 365 Aguayo A. T. 3001 Abmadi G. 5137 Aït-Lyazidi H. 1857 Agrawal R. 365
Aguayo A. T. 3001
Ahmadi G. 5137
Aït-Lyazidi H. 1857
Aittamaa J. 4335
Akiyama T. 3551 (SC)
Al-Dahhan M. H. 2139, 2721
Alarcón Z. 2739, 3367 (SC)
Albers E. 3391
Albulescu C. 4745 (SC)
Ale Ebrahim H. 4253
Alejski K. 4237
Alfano O. M. 3169
Aloi L. E. 1523
Alós M. A. 3089
Alvarez-Ramirez J. 4183
Amadeo N. 683
Amin N. A. S. 2079, 4561
An-Ping Zeng 2305
Andersen S. I. 3273
Andreussi P. 353
Antonucci P. L. 3013
Antorrena G. 3317
Aoki K. M. 3551 (SC)
Aoun M. 2449
Appelhaus P. 1919
Appleby S. 251
Ar I. 2523
Aracil J. 2841
Arad S. 1487
Arato E. 3013
Araujo M. L. G. C. 2835
Arest-Yakubovich A. A. 2775
Armitage P. D. 2781
Armold F. H. 5091
Arotcarena M. 2781
Arumugam B. K. 701
Arvelo R. 4385
Asai S. 1343 (SC)
Asprey S. P. 4681
Assabumrungrat S. 5241
Assaf E. M. 3107
Assaf J. M. 2921
Astarita G. 3213, 4353 (LE), 4631
Bai D. 957

Bai D. 957
Baiker A. 2897
Bakhshi N. N. 3697
Bakker R. A. 2643
Balakotaiah V. 401
Ballamudi R. K. 3193
Baltzis B. C. 2757, 3801
Banat F. A. 1257
Bangia A. K. 1757
Baptista C. M. S. G. 3119
Barna L. 3861
Baron G. V. 1287, 1299, 1869
Bär M. 1757
Bartelmus G. 2733
Bártlová M. 4347
Basak T. 387
Basmadjian D. 1043
Bassani C. 2793
Basu P. 1
Batista L. M. F. L. 1807
Bayer Th. 2909
Baygents J. C. 5205
Becker S. 1715
Beenackers A. A. C. M. 2727
Behie L. A. 2805, 5251
Bejan A. 387
Bellhouse B. J. 3373
de Bellefon C. 2149

Benfer R. 1735
Benito P. L. 3001
Benneker A. H. 2099
Benson S. 2037
Berezowski M. 3125, 3307
Bergel A. 2337
Beris A. N. 1451
Berk D. 2607
Berlan J. 1847, 1857
Berro C. 3861
Berruti F. 2661, 2751, 2805
Berthiaux H. 4509
Bertrand J. 1725
Betenbaugh M. J. 326 (BR)
Bhatia S. K. 587, 1241
Bi H. T. 663 (SC)
Bialecki R. A. 4369
Bilbao J. 3001
Bjorklund M. C. 2945
Blagov S. A. 2559
Blanchard J. M. 3861
Blet V. 295
Boateng A. A. 4167
Bogere M. N. 603
Bohin F. 5193
Bojkov B. 905
Bolk J. W. 2231
Bonelli P. 3721
Borio D. O. 2927
Borrego A. G. 4289
Bos A. 2541
Bosco F. 2853
Boshoff-Mostert L. 1107
Bossoutrot J.-M. 4939
Bourfin V. 269
Bousfield D. W. 4611
Bowen B. D. 4197
Bowen W. R. 4321
Bowman C. N. 4781
Boyes A. P. 2715
Brandani S. 3283, 4631, 4639
Brandi R. J. 3169
Briels W. J. 99
Brito A. 4385
Broadbelt L. J. 3337
Brooks B. W. 3223, 3591
Brooks C. A. 3847
Brouwer J. P. 3101
Brown P. A. 757
Brucato A. 3557
van Brugge P. T. M. 2053
Bruinsma O. S. L. 2595
Brunner Ch. 623
Buitendijk F. G. J. 1569
Burgass R. W. 159
Burgass R. W. 159
Burghardt A. 2733, 3125, 3307, 4043 (LE)
Burns J. R. 1347 (SC)
de Buruaga I. S. 2781
Buyevich Yu. A. 635, 4843

Cabassud M. 2243, 3163
Calderón M. C. R. 683

Cabassud M. 2243, 3163
Calderón M. C. R. 683
Calis H. P. 1789
Camacho-Rubio F. 4159
Cameron I. T. 769
Campos J. B. L. M. 45
Capannelli G. 1817
Caralp L. 5125
Carlsen M. 37
Caron-Charles M. 4649
Carosini E. 1817
Carr R. W. 2945
Carta G. 807, 819
Caruthers J. M. 4827
Casagrande M. 1023
Casal J. 5149
Casamatta G. 2243, 3163
Cassanello M. 3721, 2011
Cassano A. E. 3169
Castalgna F. 3709
Castilla M. 3001
Castillo J. L. 5325
Cavani F. 1817
Cezerac J. 2243
Chakravarthy V. S. 3613

Chalmers J. J. 947
Chamayou A. 3163
Chang P. C. 2601
Chaouki J. 2011
Chaouki J. 713
Charton S. 295
Chaudhari R. V. 2069, 1663
Chavarie C. 1173 (SC)
Chen B. H. 2169, 2983
Chen D. 2687
Chen Laiyuan, 515
Chen Y.-S. 1837
Cheng Y. S. 1909
Cheng Y.-L. 4517
Cheng-Ching Yu 1187
Cheng-Ching Yu 1187
Cheng-Ching Yu 1187
Cheng-Ching Yu 1187
Cheng-Yu Ning 3289
Chengfa Jiang 689
Chengyue Li 2951
Chern C. S. 1079
Cherry R. S. 1523
Chhabra R. P. 4531 (SC), 5353 (SC)
Chiang A. S. T. 207
Chien-Chong Chen 5159
Chin-Chin Tsai 3289
Cho D. H. 81
Chocrón M. 683
Chong Zheng 1957
Chong-Hung Tsai 5159
Choplin L. 1947
Christiansen R. L. 1221
Chuei-Tin Chang 3951
Chun-Chong Fu 5159
Chung J. D. 1509
Chung Sung Tan 5357 (SC)
Cioci F. 2823
Ciofalo M. 3557
Claessens R. 1869
Clark M. C. 2369
Claus G. 4075
Co A. 1417
Cockrem M. C. M. 839 (BR)
Cognet P. 1847
Colakyan M. 2139
Comtat M. 2337
Conlisk A. T. 1157, 1275
Converti A. 1023
Coppens M. O. 2283
Corriou J. P. 295
Costamagna P. 3013
Costesèque P. 4463
Coteron A. 2841
Coulston G. W. 1691
Cournil M. 4537
Contaile O. D. 3193
de Croon M. H. J. M. 2109, 2583
Crawley G. M. 4537
Crisalle O. D. 3193
de Croon M. H. J. M. 2109, 2583
Crudros F. 4189
Cui Y. Q. 2631
Cukierman A. L. 3721
Czechowicz D. 4271

Czechowicz D. 4271

Dabir B. 2553
Dai Q. L. 2983
Dam-Johansen K. 587
Danesh A. 159
Daskopoulos Ph. 1569
David R. 309, 2449, 4939
Datta R. 649
Davoudirad H. R. 2553
de Castro F. H.-B. 119, 4289
e Castro J. A. A. M. 3119
De Giovanni M. 1023
De Hoces M. C. 4289
De Swart J. W. A. 4619
Debling J. A. 4859
Deckwer W.-D. 2305
Deerberg G. 3113
Defaye G. 5125
Degaleesan S. 1967
Dejin Liu 4045
Del Borghi M. 1023
Delgado J. A. 1113, 2811
Delmas H. 2149, 2161, 1857
Den Uil H. 2541
Dengxi Wu 1405
Denk V. 5227 (SC)
Desmet G. 1287, 1299
Dessau R. M. 535
Devotta I. 561, 3881

Dhaouadi H. 2625
Di Blasi C. 1121, 2211
Diamond S. L. 5299
de Diego L. F. 3077
Diepen P. J. 2315
Dierendonck L. L. V. 2479
Dixon D. A. 1691
Dixon D. G. 4759
Do D. D. 423, 4145
Döbert F. 2873
Dodds J. 4509
Doepper R. 2933
Doğu G. 2201, 2523
Doğu T. 2201, 2523
Dong Hyun Kim 3059, 4137
Dongming Li 3623
Dorcas A. 4681
Douglass R. W. 4963
Drew D. W. 1777
Duchêne P. 4661
Duduković M. P. 571, 3083, 1703, 1967, 2139, 2721
Duo W. 2541
Duprat F. 4237
Duvedi A. P. 3727
Duverneuil P. 1847
Dziubiński M. 4533 (SC)
Eigenberger G. 1715, 2409, 4903, 4915

Eigenberger G. 1715, 2409, 4903, 4915 Elgeti K. 5077 de Elguea C. G.-O. 1113 Ellenberger J. 2041 Engell S. 1919 Ertl G. 1683, 1757 Eteshola E. 1487

Ertl G. 1683, 1757
Eteshola E. 1487

Fabre P.-L. 1847, 1857
Falk L. 2439, 5053, 5187
Fan L.-S. 2501
Fang X. 2673
Fardis M. N. 505
Fargue D. 4463
Fasol Ch. 1947
Favelukis M. 1169 (SC)
Fedorov A. Ya. 2613
Fedou R. 5017
Feilenreiter T. 5263
Feke D. L. 5193
Feliu J. A. 2793
Femat R. 4183
Fialová M. 2491
Field R. 1405
Filho R. M. 1807
Filippov L. K. 4013
Finch J. A. 3665
Fissan H. 1199
Fitzgerald P. A. 2829
Fleischer C. 1715
Floarea O. 4745 (SC)
Fogl T. H. A. 3019
Foka M. 713
Font R. 5007
Fortuin J. M. H. 3095
Forzatti P. 2965
Foscolo P. U. 4639
Fotopoulos J. 1899
Fotopoulos J. 1899
Fotouh K. 3763, 4923, 4933
Fouda A. E. 4043 (LE)
Fournier M.-C. 5053, 5187
Fox R. O. 1929
Frank M. J. W. 2619
Franzén C. J. 3391
Fredrickson A. G. v (E)
Froment G. F. 2091, 1879
Fukada K. 1879
Funamizu N. 341
Fusco M. 1807

Galtier P. A. 2709
Galvin K. P. 3241
Gandhi K. S. 1393, 4423
Gani R. 3675
Gantang Chen 1957
Ganz J. 3181
Garcia F. J. 4385
Garcia M. T. 4385
Garcia T. 2841
Gaube J. 2873
Gayan P. 3077
Gayubo A. G. 3001
Gelosa D. 1827
Genyuan Li 4801
Georgakis C. 1899
Gerard P. 3349
Gerbec M. 5081

Gerritsen A. W. 1789
Gerth L. 3813
Ghanem-Lakhal A. 1847
Gibilaro L. G. 4639
Giddings J. C. 4477
Ginter D. M. 3685
Giona M. 2273, 4717, 4731, 5065
Giordano R. C. 2835, 3107
Giot M. 4579
Gladden L. F. 2263
Glass D. H. 3479
Glasser D. 2399, 4749
Glasz W. Ch. 3019
Glukhovskoi V. S. 2775
Gluz M. D. 2915
Gobina E. 3045
Godfrey V. M. 757
Goetz J. 2879
Gómez M. G. 2739, 3367 (SC)
Gonzalez-Marcos J. A. 2811, 1113
González-Tello P. 4159
González-Velasco J. R. 1113, 2811
Gonzo E. E. 835 (SC)
Goossens I. 2461
Gottifredi J. C. 835 (SC)
Gottlieb M. 1487
Gourdon C. 5313
Gozlan J.-P. 4649
Grace J. R. 663 (SC)
Graham M. D. 165 (BR), 1757
Granger J. 3781
Greated C. A. 3479
Green M. 769
Greenberg N. 743
Grenier Ph. 269
Grevskott S. 1703
Griolet F. 3213
Grisafi F. 3557
Groen J. S. 2511
de Groot C. 2053
Gros P. 2337
Gruy F. 4537
Grzegorczyk D. S. 807, 819
Grzywna Z. J. 4115
Gugliotta L. M. 2781
Guihua Qian 667 (SC), 2693
Guiochon G. 4307
Gunn D. J. 2673
Guo-Hua Xiu 4039 (SC)
Guoming Zhong 4307
Guony Ma 3059
Gupte S. P. 2069
Gutiérrez-Ortiz J. I. 1113
Gutsche R. 3519, 3537
Guy C. 713, 2011

Guy C. 713, 2011

Hagey L. 2885

Haiming Lai 2951

Hanagandi V. 1071

Hanák L. 2655

Hanika J. 3145

Hansen J. AA. 967

Harold M. P. 1777

Harris C. K. 1569

Hartman M. 5229 (SC)

Hartmann K. 3519, 3537

Hasegawa T. 2847

Hashimoto K. 1879, 2971

Hassager O. 1431

Hatakeda K. 2817

Havelka P. 5223 (SC)

Hayashi J.-I. 3027

Haynes H. W. Jr. 1133

Haywood R. J. 479, 491

Heiszwolf J. J. 3095

Hejda I. 3139

Hellenbrand R. 4219

Hellmsing M. P. 3039

Henson M. A. 931

Heping Cui 2693

Hessari F. A. 1241

Hesse D. 1889

Heyberger A. 893

Heyes D. M. 873

Hideg J. 2655

Hildebrandt D. 2399, 4749

Hinderink A. P. 4693, 4701

Hinrichsen O. 1683

Hipp A. K. 281

Hjarbo K. W. 1703

Hjertager B. H. 233

Ho-Shing Wu, 827 (SC)

Hockey R. M. 4405

Hoffmann A. C. 4279
Hoffmann U. 329, 1837, 2359
Hokka C. O. 2835
Holmen A. 2687
Homer J. 127, 141 (SC)
Hong-Den Yu 1187
Hongzhong Li 4045
Hoomans B. P. B. 99
Horlo M. 3033
Hornut J. M. 2625
Horst C. 1837
Houwers J. 2315
Houwers J. 2315
Howell J. 1405
de Hoces M. C. 119
Hsiao-Kuo D. Hsuen 4215 (SC)
Hsu T. J. 2589
Hua C. C. 1473
Huang R. Y. M. 4673
Hudson J. L. 1747, 2179
Hughes R. 3045
Hui-Bo Lu, 3829
Huttenhuis P. J. G. 5273

Idem R. O. 3697 Iguchi T. 3551 (SC) Ikeda H. 1879 Ikushima Y. 2817 Iliuta I. 4579, 4987 Ilyin B. A. 671 Immonen K. 2799 Infelta P. P. 4489 Inoue K. 2971 Iyengar V. R. 1417 Iyer R. R. 4611

Jaeger N. I. 1747
Jaffe S. B. 1615
Jamet Ph. 4463
Jamshidi E. 4253
Janssen L. P. B. M. 2479
Jelemensky L. 1767
Jež J. 4347
Jezequel P. H. 309
Ji-Wei Yu 4355
Jianfeng Chen 1957
Jiang P. 2501
Jiann-Long Song 4393
Jicheng Bi 2745
Jimenez D. M. 789, 3051
Jin Y. 2001
Jin-Ru Hwang 3951
Jinghai Li 667 (SC), 2693
Jobson M. 4749
Joly-Vuillemin C. 2149
Jones M. C. 1009
Jones M. C. 1009
Jones R. L. 1365
de Jong K. P. 2053
Juncu Gh. 3101, 4745 (SC)
Jurado-Alameda E. 4159
Jutan A. 3325
Ka-Kheng Tan 4127

Jutan A. 3325

Ka-Kheng Tan 4127
Kabir H. 3781
Kakhu A. I. 127, 141 (SC)
Kalogerakis N. 1979, 5251
Kam E. K. T. 2939
Kaminsky V. A. 2613
Kammel U. 2253
Kane L. 1365
Kantzas A. 1979
Karamanev D. G. 1173 (SC)
Kasai S. 2847
Kato K. 957
Kawase M. 2971
Keil F. J. 1543, 2667
Kerkhof F. P. J. M. 4693, 4701
Kershenbaum L. S. 1909
Kevrekidis I. G. 1757
Khadilkar M. R. 2139, 2721
Khinast J. 623
Kiel J. H. A. 2541
Kiil S. 587
Kikuchi R. 2865
Kiljański T. 4533 (SC)
Kim D.-J. 4827
Kim S. v (E)
Kimm N. K. 2661
King B. 423
Kiparissides C. 1637, 2461
Kirby J. M. 3647
Kirchner T. 2409
Kirkby N. F. 2541

Kirkhorn S. S. 3449
Kiwi-Minsker L. 2933
Kleijn C. R. 2119
Kleinig A. R. 5103
Klvana D. 713
Knudsen K. 3273
Kocjančič R. 5081
Koenders M. A. 3897
Koeppel R. A. 2897
Kofke D. A. 5299
Kojima T. 2745
Kontogeorgis G. M. 3247
van der Kooi H. J. 4693, 4701
Kopaç T. 2201
Korbee R. 2021
Korbee R. 2021
Kosaka A. 3033
Kostenko O. V. 2989
Kotlar E. 2327
Kouchen Tsai 1929
Koval C. A. 4781
Kozlovskaya E. D. 671
Krammer G. F. 623
Krishna R. 2041, 4619
Krishnamurthy V. P. 2069
Krishnan C. 4769
Krishnan C. 4769
Krishnan C. 4769
Kriglov A. V. 2945
Krūger B. 2909
Kruglov A. V. 2945
Krūger B. 2909
Kruglov A. 1827
Kruis F. E. 2439
Kubiček M. 3157
Kubie J. 4997
Kuijlaars K. J. 2119
Kuipers J. A. M. 99, 2221, 2619, 4087, 5273
Kuipers N. J. M. 2727
Kulkarni M. S. 571, 3083
Kumar R. 1393, 4423
Kumar S. B. 1967
Kumar S. 831 (SC), 1311, 1333
Kun Soo Chang 3059
Kunz U. 1837
Kuo Y. N. 1079
Kusakabe K. 3027
Kuster B. F. M. 1767
Kvasnak W. 5137

Łabęcki M. 4197
Laborde M. 683

Kuster B. F. M. 1767
Kvasnak W. 5137

Laborde M. 683
Lachowicz A. 4271
Lacoste G. 1847
Lamb H. H. 441
Lamberto D. J. 733
Lamine A. S. 3813
Lancia A. 3889
Lang J. 1055
Lange J.-P. 2379
Lange R. 3145
Langston P. A. 873
Larachi F. 2011
de Lasa H. 1799, 2885
Latifi M. A. 3139
Laurindo J. B. 5171
Lavecchia R. 2823
Laveda M. L. 5007
Lawal A. 3427
Le Gall H. 3813
Le Lann M. V. 2243, 3163
Le Queré P. 5341
LeVan M. D. 4025
Leclerc J. P. 3709
Lederhos J. P. 1221
Lee D. J. 1353 (LE), 2589, 2601
Lee I.-M. 2681
Lee J. 217, 521
Lee P. L. 769
Lehtonen J. 2799
Leib T. M. 2189
Leitão A. 4595
Leiza J. R. 2781
Lennemann F. 4065
Leppinen D. M. 479, 491
Lerou J. J. 1595, 1691, 1777, 2189
Leshinski E. 5111
Levan M. D. 5341
Li H. Z. 1947
Li J. 549
Liang W.-G. 2001
Liang-Hong Liu 2179, 3071
Liauw M. A. 4259
Lie A. B. K. 4693, 4701
Liepold A. 3007
Lieto J. 3213

Lietti L. 2965
Lightfoot E. N. 325 (BR), 503 (BR)
Lightart J. 2793
Lim P. K. 757
Lin Liwu, 515
Lin W. W. 1353 (LE)
Linek V. 3203, 3875, 5223 (SC)
Liping Sun 947
Little I. P. 3647
Litvinenko G. I. 2471
Livingston A. G. 4219
Lixiong Wen 667 (SC), 2693
Llop M. F. 5149
Lobo L. S. 2577
Loney N. W. 3995
Long J. P. 1221
Louleh Z. 3163
Löwe A. 1267
Loyalka S. K. 3685
Lu D. W. 2983
Lücke T. 1199
Lüdke I. 3131
Lund A. 3449
Luo L. A. 3781
Luss D. 1777, 4259
Lutz M. 5227 (SC)
Luus R. 905
Luyben K. Ch. A. M. 995, 2315, 2631
Luzôn González G. 4159
Lynch D. T. 2061
M'Saad M. 3139

M'Saad M. 3139
MacTaggart R. S. 1209
Maciel Filho R. 2859
Madrid F. 5149
Maeder S. 2479
Maier E. E. 549
Makai J. 2655
Makishita N. 2847
Makkee M. 3039
Malloggi S. 2965
Manas-Zloczower I. 5
Manjunath S. 4423
Manousiouthakis V. I.
Manteghian M. 2547
Manth T. 2565, 2571
Mantzavinos D. 4219
Mao J. 1275 M'Saad M. 1209 1089 Mantzavinos D. 4219
Mao J. 1275
Marek M. 3157
María G. 2891
Marin A. 2891
Marin G. B. 1767, 2109, 2583
Márkl H. 4065
Márquez M. A. 2959
Martinez G. M. 1043
Martinez M. 2841
Marton Gy. 2655
Masbernat O. 5313
Maschio G. 2793
Mashelkar R. A. 561, 3881
Masliyah J. H. 1209
Masuda T. 1879
Masuda Y. 957
Mate A. 5313
Mather A. E. 841
Matsukata M. 2529, 2769
Matsushita T. 2769
Mavrovouniotis M. L. 1495
Mayer M. J. J. 3441
Mazet N. 3829
Mazzotti M. 1827
McCoy B. J. 2903
McCutchen M. S. 2959
McGreavy C. 2169, 2977
McKay A. 5353 (SC)
Meadhra R. O. 3919, 3943
Meeten G. H. 1355 (LE)
Meetsma W. A. 4279
Mehra A. 461
Mehrotra A. K. 5251
Meier A. 3181
Melikhov I. V. 671
Membrez J. 4489
Mendes-Tatsis M. A. 3755
Meng-Shyang Fu 5357 (SC)
Merchuk J. C. 2915
Merrath S. 4065
Mertl M. 2909
Mesters C. M. A. M. 2053
Metcalfe I. S. 4219
Meuldijk J. 2787, 3441
Meunier F. 269
Mewes D. 2131
Meyerhoff K. 1889 Middelberg A. P. J. 5103
Mignon D. 2565, 2571
Miklovicova E. 3139
Mills P. L. 2189
Minet R. G. 2037, 4103
Miracca I. 2349
Miyakawa H. 2847
Miyatani T. 2529
Mizan T. I. 549
Mleczko L. 3187, 3575
Moldrup P. 967
Moljord K. 2687
Möller K. P. 3403
Mongkhonsi T. 1909
Mongruel A. 4321
Monticelli O. 1817
Moore L. R. 947
Mooson Kwauk 2693, 4045
Morbidelli M. 1827
Morbidelli M. 1827
Morchain J. 5313
Moreas S. B. M. 3931
Mori Y. H. 3505
Morooka S. 3027
Morsi B. I. 549
Mortensen M. 2037
Morud K. E. 233
Moszkowicz P. 3861, 4075
Mou C. Y. 2589, 2601
Moucha T. 3203, 3875
Mougin P. 2293
Moulijn J. A. 3019, 3039
Mudde R. F. 2511, 2763
Muhammad O. H. J. 2939
Muhler M. 1683
Muhr H. 309
Mulder A. 3101
Muller S. 2891
Muntean O. 4579, 4987
Munz R. J. 2607
Murzin D. Yu. 155, 2879
Murzin D. 55
Musmarra D. 3889
Muzzio F. J. 733
Myeong Hee Moon 4477
Nadeau P. 2607

Myeong Hee Moon 4477

Nadeau P. 2607
Nag P. K. 1
Nagata H. 3027
Nagata T. 725, 1231
Nakagawa N. 957
Nakamura H. 1343 (SC)
Nakazono H. 3033
Nakhmanovich B. I. 2775
Narsimhan G. 1377
Nascimento C. A. O. 3107
Nasr-El-Din H. A. 1209
Nassimbene R. D. 1009
Natalukha I. A. 1181
Navaza J. M. 3317
Nedderman R. M. 3931, 4605
Neri B. 1827
Neudeck G. W. 2681
Neurock M. 1691
Newson E. 2891
Neylon M. K. 851
Ng K. M. 1595
Nguyen H. D. 4963
Nicole Ch. 5213
Nielsen J. 37
Niemeyer B. 5263
Nieuwland J. J. 4087
Niklasson C. 3391
Nikolaou M. 1071
Nishimoto K. 3551 (SC)
Nitsche J. M. 5299
Noble R. D. 4781
Noskov A. S. 2989
Nosoko T. 725, 1231
Nouri J. M. 4405
Nyholm P. 2799

O'Connor A. J. 3459

O'Connor A. J. 3459
O'Connor C. T. 3403
Offermann H. 2565, 2571
Ogunnaike B. A. 931
Oinas P. 2625
Okrasinski W. 4189
Oldeman R. G. C. 2511
Oliveira R. P. 2835
Oost C. 329
Orell A. 5111
Ostermaier J. J. 1777
Ostrowski T. 3187

Othen S. M. 4605 Otterstedt R. D. 1747 Ottino J. M. 3613 Otto F. D. 841 Oyakawa K. 725

Paatero E. 2799
Paik S. 4963
Pais F. I. C. C. 321 (SC)
Pakuro N. I. 2775
Pal R. 3299
Palanki S. 449
Panagos E. 3175
Pannek U. 3575
Papadakis V. G. 505
Papadopoulos K. D. 5043
Papageorgiou J. N. 2091
Papayannakos N. G. 2709
Park H. M. 81
Park Y. G. 4295
Parra E. 2739, 3367 (SC)
Parulekar S. J. 217, 2079, 4561
Patisson F. 5213
Pedernera M. 2927
Peferoen D. G. R. 2053
Pekediz A. 1799, 2885
Pellegrini L. 3151
Pelton R. 4437
Pepe F. 3889
Peppas N. A. 4827
Perez de Ortiz E. S. 3755
Pijolat M. 2535
Pinkas P. 3157
Pinto A. M. F. R. 45
Pinto J. C. 63
Piret J. M. 4197
Pironti F. 2739
Pladis P. 2461
Plasari E. 2449
Plath P. J. 1747
Ploehn H. 1071
Podkopov V. M. 671
Podual K. 1393
Poletto M. 3741
Poncin S. 2625
Pons M. 2293
Pop I. 4963
Popa V. T. 3657
Porchet S. 2933
Porras J. A. 2927
Portugal A. A. T. G. 321 (SC)
Portugal I. 2577
Post J. W. 2099
Pottmann M. 931
Prat M. 5171
Pratt H. R. C. 27, 3459
Prigent M. 3709
Pritzker M. D. 3631
Procházka J. 893
Provine W. D. 1691
Pruski J. 1799
Puchyr D. M. J. 5251
Pugsley T. S. 2661, 2751

Qi J. S. 4769 Qiusheng Liu 4551 Quann R. J. 1615

Quann R. J. 1615

Rabinovich A. B. 2613
Rabitz H. 4801
Rahman A. K. M. S. 449
Raja Rao T. B. M. L. 2701
Rajashekharam M. V. 1663
Ramirez W. F. 521
Ramkrishna D. 1311, 1333, 1377, 4423, 4887
Ramos J. I. 981
Ramshaw C. 1347 (SC)
Ranade V. V. 2637
Rangaiah G. P. 1149
Rao K. K. 387
Rapagna S. 4639
Raphael M. 4379
Rasmussen H. K. 1431
Rasmussen P. 3675
Ratsimba B. 1857
Rauzy E. 3861
Ray W. H. 63, 281, 4859
Raymond C. S. 4443
Rebo H. P. 2687
Reddy S. 947
Reese J. 2501
Régnier N. 5125
Reichert K.-H. 3131
Reinecke N. 2131

Reinhold G. 4065
Rekoske J. E. 3337
Renken A. 2479, 2933, 4489
Renksizbulut M. 479, 491
Renz U. 3491
Reschetilowski W. 3007
Reverchon E. 3741
Riazi M. R. 2553
Rice N. M. 4681
Richardson J. F. 4531 (SC)
Rigby S. P. 2263
Rivette N. J. 5205
Rix S. J. L. 3479
Roberts G. L. 789, 3051
Roberts G. W. 441, 2959
Robinson R. L. 1357
Rodrigues A. 4595
Rodrigues J. A. D. 2859
Roduit B. 2897
Roekaerts D. 1569
Rohani S. 4379
Rong S. 2885
Roos K. 3007
Roquero P. 1847
Rosendal F. J. J. 1569
Rosner D. E. 5325
Rosowski F. 1683
Rotermund H.-H. 1757
Rots P. E. A. 2763
Rotter J. M. 3967
Rouchon P. 4661
Rouiller C. O. 2921
Rovatti M. 1023
Roy S. 1967
Ruggeri B. 2853
Russell B. P. 4025

Sadhankar R. R. 2061
Sáez A. E. 2739, 3367 (SC)
Sahimi M. 3409
Saito A. 3033
Saito N. 2817
Salinger A. G. 4903, 4915
Salmi T. 55, 2799, 4335
Samson R. 1173 (SC)
Samyudia Y. 769
Sane S. U. 1133
Sannæs B. H. 1703
van Santen R. A. 1691
Santos V. 3317
Saracco G. 5289
Sasongko D. 3909
Sassi G. 2853
Sathyagal A. N. 1377
Sato O. 2817
Savage P. E. 851
Sayer J. C. 1747
Scharfenberg R. 1889
Schieber J. D. 1473
Schlüter S. 2253, 3113
Schouten J. C. 1991, 2021, 2693
Schunk J. 2655
Schwaber J. S. 931
Schwalm M. K. 2273, 4717, 4731, 5065
Schwalm W. A. 2273, 4717, 4731, 5065
Schwarz J. A. 3657
Schweich D. 3709
Seaton N. A. 3257
Segantini G. 3349
Semiat R. 1169 (SC), 5111
Seville J. P. K. 2541
Shaikh A. A. 3065
Shapiro M. 5017
Sharifi H. 4817
Shaw J. M. 4817
Sheardown H. 4517
Sheintuch M. 535, 743, 2327
Shen G. 3665
Shi-Chang Wang 3235
Shibuya E. 957
Shibuya N. 3033
Shih-Haur Shen 1187
Shih-Yuan Lu 4393
Shima S. 3033
Shindo Y. 4979
Shing K. S. 3409
Shiraishi F. 2847
Shishido M. 859
Shou Xu 841
Shukla K. 3763, 4923, 4933
Siccama N. B. 2231
Sie S. T. 2041
Siemund S. 3709
Silveston P. L. 2419

Simandl J. 1257
Simms C. C. 701
Simon G. 2655
Singh C. P. P. 549
Singh J. 4499
Sinkule J. 3203, 3875, 5223 (SC)
Siquier S. 2739, 3367 (SC)
Skogestad S. 4949
Skutil K. 4271
Slattery J. C. v (E), 1357
Sloan E. D. Jr, 1221
Smeulders J. B. A. F. 1355 (LE)
Smiles D. E. 3647
Smits H. A. 3019
Snip O. C. 2021
Sobey I. J. 3373
Sobolik V. 5227 (SC)
Sodero S. F. 2805
Soldati A. 353
Solokhin A. V. 2559
Somani M. 4259
Sonolikar R. L. 2701
Sørensen E. 4949
Sørensen P. B. 967
Sottile C. 2793
Soustelle M. 2535
Sovová H. 4347
Specchia S. 5289
Specchia V. 2853, 5239
Spinner B. 3829
Spontak R. J. 1365
Stamhuis E. J. 2727
Stankiewicz A. 3019
Staudinger G. 623
Steinfeld A. 3181
Steiff A. 2253, 3113
Stenby E. H. 3273
Stenger H. G. Jr. 1899
Stephanopoulos G. 1509
Stergaršek A. 5081
Stevens G. W. 27, 3459
Stewart W. E. 3887 (LE)
Stoica-Guzun A. 4745 (SC)
Stoukides M. 3175
Strozzi F. 3089
Suárez R. 4183
Štastová J. 4347
Stüber F. 2161
Stubington J. F. 3909
Subramanian B. 2369
Subramanian B. 2401 Subramaniam B. 2369 Subramanian S. 401 Sugaya M. 3505 Sum A. 1221 Sun L. M. 269, 5341 Sundmacher K. 2359 Sureshkumar R. 1451 Suzuki T. B. 2971 Svendsen H. F. 1703 Svoboda K. 5229 (SC) van Swaaij W. P. M. 99, 2221, 2619, 4087, 5273 de Swaan Arons J. 4693, 4701 Swanson P. D. 733 Snita D. 3157 Szánya T. 2655

Szánya T. 2655

Tablino Possio C. 3151
Tagliabue L. 2349
Taitel Y. 695
Takács K. 1789
Takakuwa T. 341
Takeda K. 2529
Takemura F. 4551
Takoudis C. G. 1673, 2681
Tan T. C. 4001
Taniewski M. 4271
Tartakovsky B. 743, 2327
Tassios D. P. 3247
Tavare N. S. 2547
Tekie Z. 549
Temos J. 27
Teng H. 4979
Thanos A. M. 2709
Thiam-Chye Tan 1027
Thoenes D. 2787, 3441
Thomas D. 2649
Thomsen K. 3675
Thorpe R. B. 4127
Thovert J.-F. 5017
Thyrion F. C. 4579, 4987
Tietze A. 3131
Tijm P. J. A. 2379
Tiltscher H. 5263
Tingyue Gu 3773 1673, 2681 To-Jo Liu 3289
Toda M. 859
Todd A. C. 159
Tohidi B. 159
Tolia A. A. 1673
Tondeur D. 3781
Tonkovich A. L. Y. 789, 3051
Tonkovich A. L. Y. 789, 3051
Topalis E. 2461
Toppinen S. 4335
Torraca N. 3557
Toulouse C. 2243
Touroude R. 2879
Trabelsi F. 1857
Trifiro F. 1817
Trinh S. 4887
Trnka O. 5229 (SC)
Troelstra E. J. 2479
Tronconi E. 2965
Trotta R. 2349
Tsangaris D. M. 2757, 3801
Tsotsis T. T. 2037, 4103
Tsutsumi A. 2865
Tüzün U. 873
Tzong-Her Hwu 3373

Ueyama K. 2529, 2769 Uhlherr P. H. T. 4531 (SC) Ulischenko M. 2879 Ulitzur S. 743 Unou K. 3033 Urdahl O. 3449 Urrutia G. 3721

Urdahl O. 3449
Urrutia G. 3721

Vaidya D. S. 5299
Valdivieso F. 2535
Valha J. 4997
Van Dam M. H. H. 995
Van Dam H. 2763
Van Den Akker H. E. A. 2119, 2511, 2643, 2763
Van Den Bleek C. M. 1789, 1991, 2021, 2693
Van Den Boomen F. H. A. M. 2787
Van Den Heuvel J. C. 2391
Van Der Hagen T. H. J. J. 2763
Van Der Ham A. G. J. 2099
Van Der Lans R. G. J. M. 2631
Van Der Wielen L. A. M. 2315
Van Leeuwen M. L. J. 2595
Van Rosmalen G. M. 2595, 3919, 3943
Vander Stappen M. L. M. 1991
Vanderschuren J. 2649, 3349
Varinot C. 4509
Vayenas C. G. 505
Vázquez G. 3317
Veenendaal M. L. 4087
Verelst H. 1287, 1299
Veselý V. 5229 (SC)
Vidal C. 5125
Viljoen H. J. 1107
Villadsen J. 37
Villarroel R. 4385
Villermaux J. 309, 1939, 2293, 2449, 5053, 5187
Vital J. 2577
Vlachos D. G. 2429, 3979
van Vliet R. E. 4619
Volpert V. A. 4443
Voudouris I. 3175
Voutsas E. C. 3247
Vreenergoor A. J. N. 1569
Vrentas C. M. 921
Vrentas J. S. 921

Walkerman P. J. 3897

Wainwright M. S. 3059
Wakeman R. J. 3897
Wang H. 1569
Wang K.-W. 3801
Wang Tao 515
Wang W.-C. 2681
Wang X. Z. 2169, 2977
Wang Z.-W. 2001
Wangqi Hou 5043
Wankat P. C. 701
Watson G. R. 3967
Waugh K. C. 1533
Weaver M. J. 1673
Webbon B. W. 4843
Weber M. E. 4499
Weerts W. L. M. 2109, 2583

Wei J. 2995
Wei-Kang Yuan 2179, 3071, 4791
Weinspach P.-M. 2253
Westerhout R. W. J. 2221
Westerterp K. R. 2099, 2231
White D. A. 5241
Wichterle K. 5227 (SC)
van der Wielen L. A. M. 995
Wiest J. M. 1441
Wilcoxson M. H. 1089
Wild G. 2625, 3813
Wilhelm A. M. 2161, 1857
Williams C. T. 1673
Williams C. T. 1673
Williams P. M. 4321
Williams P. M. 4321
Williams P. S. 4477
Wilson A. 251
Winterbottom J. M. 2715
Witt W. 3113
Witte L. 695
Witzel L. 4075
Wojcechowski B. W. 4681
Wokaun A. 2897
Wolfe J. D. 1009
Wong P. 5353 (SC)
Woods M. 2021
Wu Jinrong 515
Wu Y. X. 2139
Wurzel T. 3187
Wyss C. 2891

Xianshe Feng 4673 Xiao-Xiong Lu 2715 Xiaohua Yi 3409 Xing Zhong 3235 Xing-Gui Zhou 2179, 3071 Xu J. 365 Xu Zhusheng 515 Xuereb C. 1725

Yabe A. 4551
Yamada M. 1343 (SC)
Yamaguchi T. 4781
Yamasaki A. 4979
Yang S. H. 2169, 2977
Yaşyerli N. 2523
Yates J. G. 167
Yaunxin Wu 2721
Yi-Wei Wang 841
Yin-Chun Dai 2179
Yirme G. 743
Yizhou Zheng 3773
Yokoyama S. 3027
Yoshida K. 2865
Yoshimoto K. 2971
Yoshimura P. N. 725, 1231
Yu A. B. 1177 (SC)
Yu Chen 1027
Yu Z.-Q. 2001
Yu-Xin Wang 3235
Yuehong Xu 4477

Zacca J. J. 4859
Zagoruiko A. N. 2989
Zahradnik J. 2491
Zaldivar J. M. 3089
Zang Lianfa 515
Zare Nezhad B. 2547
Zarook S. M. 3065
Zborowski M. 947
Zehner P. 1735
Zerfa M. 3223, 3591
Zhang L. 3257
Zhang T. 649
Zhang Tao 515
Zhen-Min Cheng 4791
Zhong Y. 757
Zhong-Xiang Zhu 3325
Zhou J. 2001
Zhu J.-X. 2001